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# The long decline of a leading economy: GDP in central and northern Italy, 1300–1913

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The purpose of the article is to present the statistical reconstruction of a series of per capita output in central–northern Italy between 1300 and 1913. The various phases of both the statistical procedure and the results are presented and discussed. From the Renaissance until the 1880s, when modern growth starts, the curve of per capita GDP is downward bent. Output series together with three robustness tests, are collected in the Appendices.

While scholars agree on the rise of product in western Europe over the last two centuries, its trend in the pre-modern age is still poorly known. The opinion of some scholars is that, from 1000 onwards, the western European economy exhibits a slowly rising trend (Maddison 2001, 2003, 2007). Others, by contrast, retain that an age of slow growth, occurring from about 1000 until 1300, was followed by a period of overall stability characterised by a modest rise in some regions and decline in others. In the early modern European economies stability, rather than growth, prevailed (Clark 2007).

The Italian case study can contribute to the analysis of pre-modern output. Although the series of data on Italian population, urbanisation, prices and wages, both urban and rural, as from the first years of the fourteenth century, already suggest an outline of the development of the whole economy, however, they allow for further investigation. Here, as a summary view of these, a series of per capita and aggregate product will be built and subsequently tested.[1]

The present reconstruction is based on data concerning the centre and the north of Italy: from the southern borders of the present regions of Tuscany, Umbria and Marche up as far as the Alps (161,000 km$^2$ out of the total of

[1] As preliminary attempts at GDP reconstruction in Italy, see Malanima (2003) and Van Zanden (2005), where the author presented a reconstruction of GDP in several European regions and, among them, Italy from 1300 until 1800. See also Van Zanden (2001), based on Malanima (1994) and Van Zanden (2009, pp. 301–5).

310,000 km$^2$). Many more quantitative data are available for this part of Italy than for the south, especially before the eighteenth century. I do not intend to suggest, however, that the following GDP reconstruction is representative of the Italian trend as a whole. It is based on data referring to the centre and the north and only represents this part of Italy. Because Italy existed as a single nation from 1861, late medieval and early modern historians do not divide what was united when they focus on the centre and the north. We lack definite evidence on the difference in the average income between north and south during the late Middle Ages and Renaissance. We know, however, that, if some economic disparity did already exist, it was quite modest. The economic north–south divide has been a consequence of modernisation and has deepened with the industrialisation of the northern regions (Daniele and Malanima 2007; Felice 2007; Malanima 2006).

I will use an indirect method and will follow a two-step procedure, first estimating the agricultural product from the demand side (Section 1) and then the non-agricultural output (Section 2), which is to be added to that of agriculture (Section 3). Subsequently, I will try to test the methods and results (Appendix 1). In recent years, research on Italian national accounting after the Unification of the country in 1861 has notably progressed and we now have series of agricultural and industrial output from 1861 until 1913. I will connect my series to these and build a long-term outline from 1300 until 1913.[2]

## 1. Agricultural output

### *1.1. The method*

A basic assumption of our method of estimating agricultural output is the equality between consumption of agricultural goods and their production in the area under examination. This equality allows us to estimate output through consumption. In a pre-modern agricultural system such as the Italian one, where the imports and exports of agricultural products were relatively modest, demand for agricultural goods can actually be assumed to equate agricultural product. The centre and north of Italy imported wheat and raw materials from the south and from other non-Italian regions. They

[2] Some preliminary steps of this procedure and results were presented in Malanima (2003) (decadal series of per capita GDP in Italy from 1310 until 1860), Federico and Malanima (2004) (only the agricultural product per decade). In Malanima (2006a) a different method had been utilised to estimate GDP in the period between 1700 and 1861. A yearly series is provided here for the first time for the period between 1310 and 1861, together with the series concerning the period from 1861 to 1913 and a re-examination of the entire procedure.

also exported agricultural goods. The size of net imports or exports was negligible with regard to the agricultural product of the area.[3]

To estimate per capita agricultural output, I will first calculate an index of the demand for agricultural goods as determined by changes in wages, agricultural prices and industrial prices. According to the previous equality consumption/output, the series of demand will represent output as well. Subsequently, I will connect such an index to the series of agricultural per capita output available for the following period, starting from 1861. This procedure, from the side of consumption, has been employed several times in economic historical research, although generally for shorter periods of time (Crafts 1985, pp. 39–42; Jackson 1985; Prados de la Escosura 1988, pp. 95ff., and 1989; Allen 2000).[4]

The procedure is based on the following equation for demand:

$$Q_a = W^{\alpha} \cdot P_a^{\beta} \cdot P_i^{\gamma} \tag{1}$$

where: $Q_a$ is per capita consumption of agricultural goods; $W$ is the real wage per day or wage rate; $P_a$ is the series of real agricultural prices (divided, that is, by the consumer price index); $P_i$ is the series of real non-agricultural prices, and $\alpha$, $\beta$ and $\gamma$ are the elasticities, with $\alpha>0$, $\beta<0$ and $\gamma>0$. While agricultural consumption depends positively on real wages and non-agricultural prices, it depends negatively on the level of prices of agricultural goods.

By relying on the Slutsky–Schultz relation, we know that the sum of the demand elasticity to prices and income is 0; that is, crossed elasticity is equal to the difference between agricultural price elasticity and income elasticity. Consequently $W$, $P_a$ and $P_i$ can be expressed in 'real' terms by dividing them by the consumer price index.[5]

By taking the rates of variation (denoted by the low case) of equation 1 we obtain:

$$q = \alpha w + \beta p_a + \gamma p_i \tag{2}$$

or, taking the logarithms: $\ln q = \alpha \ln w + \beta \ln p_a + \gamma \ln p_i$
where:

$$\alpha = \frac{d \ln Q}{d \ln W}; \beta = \frac{d \ln Q}{d \ln P_a}; \gamma = \frac{d \ln Q}{d \ln P_i} \tag{3}$$

[3] After 1861, this trade in agricultural goods has been reconstructed from direct information. We will see in Appendix 1.3 that its inclusion in our estimations does not modify the results.

[4] See Evers, Mooij, and Vuuren (2008) for recent times.

[5] Actually we could use the basic series $W$, $P_a$ and $P_i$ in nominal terms, although in the empirical analysis they are ordinarily converted into real values by dividing them by the price index (as done in the present article). See on the matter the classical research by Wold (1952, chs. VI, 6 and XV, 4).

As for any pre-modern economy, our data on wages actually refer to wage rates per day, while we have no information about the number of actual working days ($t$) in a year. In equation 1, $Q$ would therefore represent daily and not yearly consumption. We know, however, that the strategy of pre-modern working families was aimed at keeping consumption stable by varying the days of work in a year. As a consequence, labour time ($t$) counterbalanced the upward and downward movement of wage rate, i.e. peasants working less when wages were high and more when wages were low. A fall in $W$ implied a rise in $t$ and vice versa (Dasgupta and Bishwanath 2005; Ranis 1997). Whenever wages per day diminished, women in particular were forced to work longer hours to meet the family needs. This strategy, implying a downward-bent labour supply as to wage rate, has been empirically ascertained in backward and developing economies. Whenever income is low, elasticity of labour supply to wage is negative (Ohtake, Takenaka and Yasui 2006). Otherwise stated: on a yearly basis, a remarkable variation in $W$ is likely to provoke a small change in $Q$ (the yearly demand for agricultural goods) since such a variation in $W$ is partially or totally compensated for by the opposite change in $t$. If we assume a low coefficient for income elasticity in our calculations, we 'incorporate' in our results the effect on demand of agricultural goods deriving from changes in labour time. On a yearly basis, we can assume that wage is the product of wage rate ($W$) by the working days in a year ($t$). Equation 4 represents agricultural consumption elasticity with respect to wage per year ($Wt$):

$$\frac{d \ln Q}{d \ln(Wt)} = \frac{d \ln Q}{d \ln W + d \ln t} = \alpha \tag{4}$$

It will hence be possible to draw information on working time from our series of GDP and observe that the working time 'embedded', so to speak, in the procedure I follow is in agreement with the theory (Appendix 1.3).

It may also be assumed that, since consumption of agricultural goods did not reveal drastic changes in the very long period under examination, based as it was on the same basket of commodities and primarily cereals (Malanima 2002, ch. VI), changes in the coefficients of elasticity must have been modest. We know that in Italy the elasticity of cereals and legumes with regard to prices and income remained stable even during the notable growth following World War II, while more expensive agricultural goods underwent considerable changes in elasticity coefficients (Messori 1992, pp. 56ff.).[6]

In the following sections, the basis of our indices is always the period 1420–40. These two decades are an epoch of low prices for which there is plenty of quantitative information.

[6] We will see, however, in the sensitivity test in Figure 6 that a change from an elasticity coefficient to another would not compromise our results.

Table 1. *Yearly rates of increase of the price index 1250–1913 (%)*

| | % |
|---|---|
| 1250–1390 | 0.68 |
| 1390–1470 | −0.28 |
| 1470–1600 | 0.95 |
| 1600–1733 | −0.18 |
| 1733–1880 | 0.76 |
| 1880–1913 | 0.53 |

*Sources:* Malanima (2002, app. III; 2007); Fenoaltea (2002) (years 1861–1913).

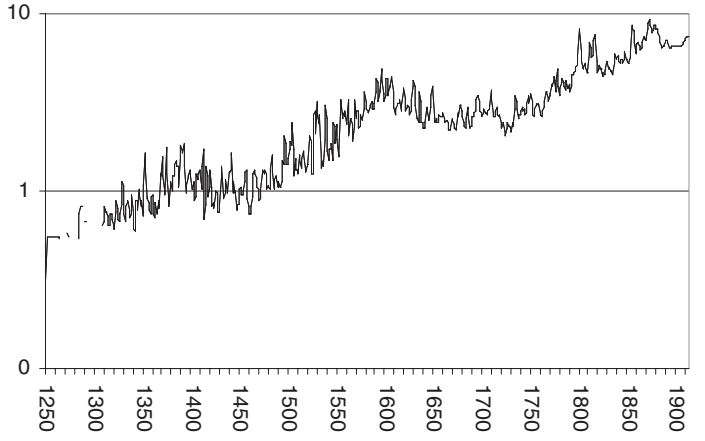


Figure 1. *Consumer price index 1250–1913 (1420–40 = 1; vertical axis in log)*

*Sources*: Malanima (2002, app. III; 2007).

### *1.2. A consumer price index*

A Laspeyres consumer price index, based on Tuscan prices from 1250 to 1606, and on prices in Lombardy from 1606 until 1861,[7] presents a long-term trend which is on the whole similar to that of price indexes elaborated for other European countries (Appendix 2, col. 1)(Figure 1).

Prices in Italy rose almost seven times from 1420–40 until 1861 and seven and a half times until 1913. For almost six centuries, from 1310 to 1861, prices rose on average at the low rate of 0.35 per cent per year (Table 1).

Common to Italy and other European regions is the much sharper rise in agricultural prices (seven- to eightfold from the fifteenth century until the end of the nineteenth century) compared to that of manufactured goods

[7] For the years 1861–1913, I used the revised Italian index of prices built by Fenoaltea (2002).

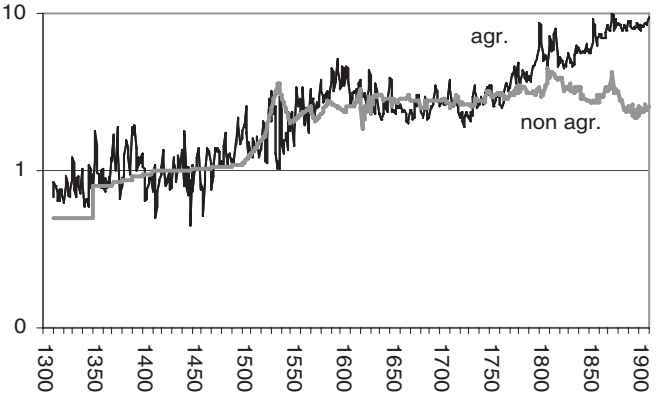


Figure 2. *Price indices of agricultural and non-agricultural goods 1300–1913 (1420–40 = 1; vertical axis in log)*

*Sources*: Malanima (2002, app. III; 2007); Federico and Malanima (2004, app.).

(only two and a half to three times) (Figure 2).[8] As in England,[9] in central–northern Italy as well, non-agricultural prices began to diverge markedly from those in agriculture from the eighteenth century on.

In pre-modern ages, it is always doubtful how representative prices in a particular region can be, when compared with the price movement in a wider area. This is particularly true in a period, such as the one we are dealing with, when market integration is limited. The consumer price index affects the whole reconstruction of the yearly product. How representative are these annual data with regards to the economy of central and northern Italy?

There is no doubt that, within a particular Italian state, such as the Republic of Florence and Duchy and Grand Duchy of Tuscany, the yearly correlation is very high.[10] The available data only allow us to examine price correlation for the main series in pre-modern consumer price indexes, i.e. wheat prices (whose weight in any consumer price index is remarkable). We know that some particular crises, such as those in 1590 or 1645–8 or 1815–17, involved a wide area and are documented by the available series referring to different Italian states. When the series are compiled using the same statistical methods, the correlation is higher than expected. A comparison of wheat prices in two distant cities such as Pisa, in Tuscany, and Udine,

[8] Actually our information refers to textiles.

[9] See the series by R. Allen in www.iisg.nl/hpw/data.php.

[10] Tuscan wheat prices are particularly well documented. The correlation among the series of Pisa, Florence, Siena and Prato is always close to 1. See the series published by Parenti (1942) (Siena); Goldthwaite (1975) (Florence); Malanima (1976) (Pisa); Menzione (1986) (Prato).

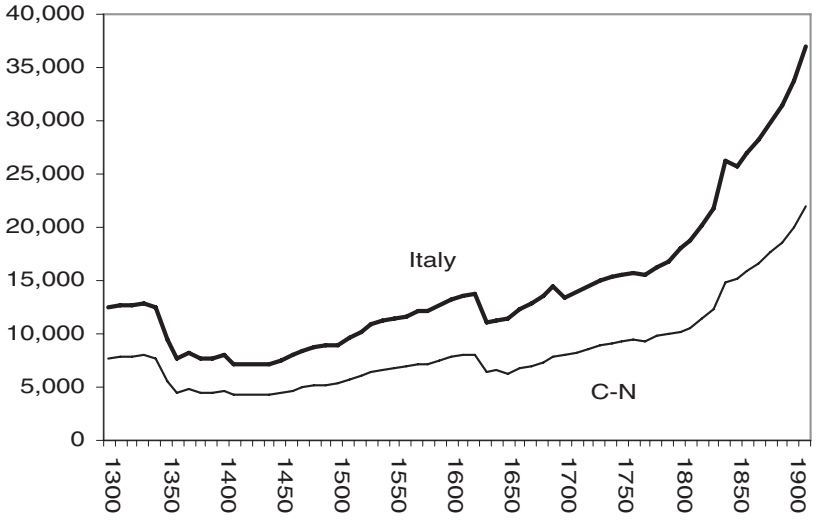


Figure 3. *Population in Italy and central–northern Italy (C-N) 1300–1913 (decadal values)*

*Sources*: Del Panta *et al.* (1996), Malanima (2002, app. I).

in the Republic of Venice, from 1500 until 1821, exhibits a correlation of 0.913.[11]

### *1.3. Prices and population*

A clear direct relationship exists between the long-term trend of prices and the population movement in Italy from the late Middle Ages onwards (Beloch 1937–61; Del Panta, Livi Bacci, Pinto and Sonnino 1996; Galloway 1994; Malanima 2002, app. 1) (Figure 3).

The population of Italy was 12–13 million in 1300 (7.7 million in the centre–north), but fell to 7.5–8 million (4.5 million in the centre–north) in the first half of the fifteenth century, recovering from 1450 to 13.3 million in 1600 (7.8 million in the centre–north)[12] (Table 2). From the end of the seventeenth century, a modern long-term increase took place in both Italy and elsewhere in Europe. At that time, the inhabitants of Italy still numbered

[11] A comparison between wheat prices in Pisa and in Udine is presented in Malanima (2009, p. 191, fig. 12). The series of wheat prices in Pisa was compiled by Malanima (1976). See also *Wheat Prices in Tuscany* in www.paolomalanima.it. Prices in Udine have been kindly provided by M. Breschi and A. Fornasin. For details on the series relating to Udine see also Fornasin (1999). I thank the authors for allowing me to utilise their unpublished data.

[12] The article by Alfani (2007) helps single out the demographic crisis at the end of the sixteenth century and in the first decades of the seventeenth.

Table 2. *Yearly rates of population growth in the centre and north of Italy 1330–1911 (%)*

| | % |
|---|---|
| 1330/40–1450/60 | −0.49 |
| 1450/60–1600/10 | 0.38 |
| 1600/10–1660/70 | −0.26 |
| 1660/70–1911 | 0.47 |

*Sources:* Del Panta *et al.* (1996), Malanima (2002, app. I).

around 13 million, as in 1300. From then on a rise occurred which intensified after 1820. By 1861, the population was 26 million and by the start of World War I it had reached 37 million.

It can be seen that the decrease in population, between 1348–1450, due to the arrival of the Black Death and subsequent plagues, did not determine a sudden decline in prices. A fall took place after some decades (Munro 2004), followed by a recovery when population once again increased after 1450. A new stagnation in prices occurred after the plagues of 1629–30 (in the centre and north) and 1656–8 (in the south). Prices rose again in the eighteenth century, with the new demographic growth.

### *1.4. Wage rates*

Rural and urban daily wage rates dating from the first decades of the fourteenth century are available for the centre and north of Italy (Malanima 2002, app. IV; 2007; *Wages in Italy 1290–1990* in www.paolomalanima.it). The wages of masons are assumed to be representative of urban wages.[13] Rural wages refer to labourers.

It is known that waged labour was very common within the cities. In the countryside it was different. Many peasant families survived on the remaining part of the harvest after having paid the rent (e.g. in the case of sharecroppers). We can therefore assume that, even when wage was not the prevailing form of income, competition among workers pushed towards the equalisation of labour incomes. The reconstruction of the agricultural contracts in the Italian countryside, which had become more and more unfavourable for the peasant population since the late Middle Ages, fits the declining trend of rural wage rates well (Giorgetti 1974).

In real terms, wage rates witnessed a downward movement from the fifteenth century onwards; although with some typical differences between

[13] And in fact they are, as is the case in Tuscany. See especially data in Parenti (1939), where series are reported for diverse urban workers.

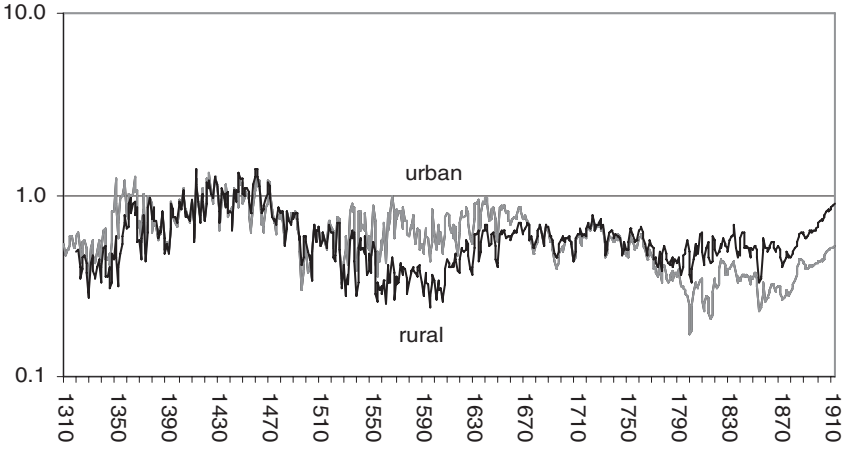


Figure 4. *Urban and rural real wage rates 1310–1913 (1420–40 = 1; vertical axis in log)*

*Sources*: Malanima (2002, app. IV; 2007); *Wages in Italy 1290–1990* in www.paolomalanima.it

town and countryside (Figure 4).[14] During the sixteenth century, together with the development of urban activities, urban wages rose in comparison to rural wages, whereas, from the seventeenth century onwards, a period of de-urbanisation and weakening of urban industrial activities, these declined more than rural wages.[15] An overall index of agricultural and industrial wages can be compiled on the basis of the previous curves of urban and rural wage rates, weighted by the urbanisation rate until 1861 and by data on employment in industry and agriculture from then onwards (Figure 5).

A downward trend characterises the real wage rate from the fifteenth century onwards. On the eve of World War I, wages per day were still lower than they had been 500 years earlier, but higher than prior to the Black Death. However, this does not mean that wages (that is wage rates multiplied by working days) in 1913 were still lower than five centuries before.

An inverse relationship between this trend and that of population is apparent. Wages recover whenever population declines, as in the fifteenth century, or stagnates, as in the seventeenth, whereas they decline in periods

[14] On the difference between my series of Italian real wages in the building industry and those by Allen (2001) and the similarity (or better identity) with those by A'Hearn (2003) see www.paolomalanima.it. I thank B. A'Hearn for having provided me with the series not published in his article.

[15] Compare the wage differential with data on urbanisation in the following Figure 8 and Table 3.

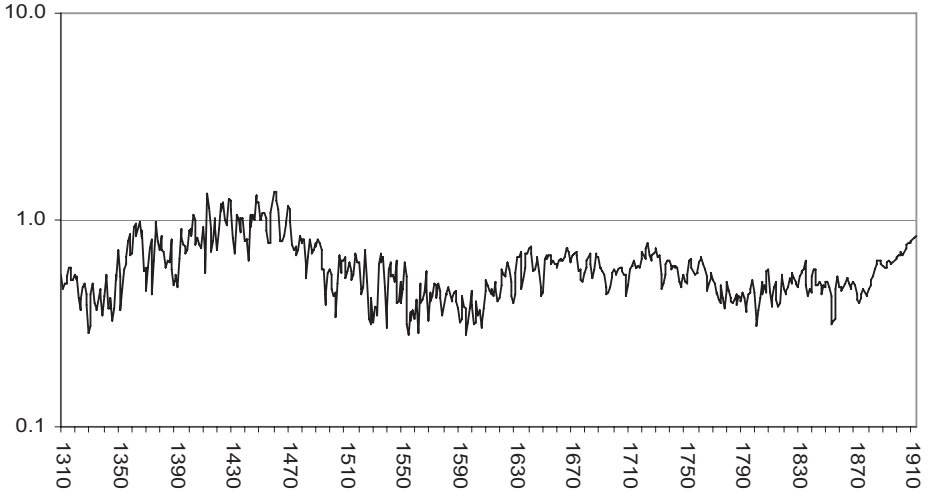


Figure 5. *Index of real wage rates 1310–1913 (1420–40 = 1; vertical axis in log)*

*Sources*: Malanima (2002, app. IV; 2007); *Wages in Italy 1290–1990* in www.paolomalanima.it

of population growth, such as during the early fourteenth, sixteenth and eighteenth centuries.

### *1.5. Interest and rent*

Other kinds of income are not included in our calculations. C. Alvarez-Nogal and L. Prados de la Escosura (2007a, 2007b) wondered if the introduction of agricultural consumption deriving from capital and land incomes would modify the indirect calculation of agricultural output based on wages. Some hypothetical calculation of the likely changes to our index of agricultural consumption may be made whenever rent and interest are included.

Let us assume that income from labour represents 70 per cent[16] of the total and incomes from land and capital 20 and 10 per cent respectively. Since we are interested in the demand of agricultural products, we should now compute an index where any form of income is weighted on both the percentage on total output of any production factor and the percentage of agricultural consumption on any form of income. Let us assume that agricultural consumption is equal to 80 per cent of labour income, 10 per cent of capital income and 10 per cent of land income. To our knowledge, the order of magnitude of these data is not unrealistic (Malanima 2009,

[16] This assumption is consistent with the calculations in Appendix 1.3.

ch. VII) and small changes in these coefficients do not compromise our calculations.

To calculate yearly agricultural consumption, the final index would be as follows:

$$\begin{gathered} \text{wage} \qquad\qquad \text{rent} \qquad\qquad \text{interest} \\ q_a = (0.70 \cdot 0.80) + (0.20 \cdot 0.10) + (0.10 \cdot 0.10) \\ \text{then } q_a = 0.56 + 0.02 + 0.01 \end{gathered} \tag{5}$$

where the first coefficient refers to the percentage of income on total output, and the second to the proportion of agricultural consumption on that specific form of income (wage in the first case, rent in the second and interest in the third). The result obtained, of about 60 per cent (56+2+1) of total income devoted to the purchase of agricultural goods, is plausible. The influence on the result deriving from the introduction of rent and interest is negligible (around 5 per cent: 3/59). Even allowing for a decrease of wage in GDP and an increase of the other forms of income, the final change would be hardly different.[17]

### *1.6. Agricultural GDP*

Following the method presented in Section 1.1, through the series of prices and wages it is now possible to outline the curve of per capita agricultural product, thereby testing the coefficients already used in this kind of research (Figure 6).

Allen, in his estimate of agricultural productivity in Europe, assumes (cross) price elasticity for non-agricultural goods of 0.1, price elasticity for agricultural products of –0.6 and income elasticity for agricultural products of 0.5. Other authors use slightly different coefficients, with income elasticity ranging from 0.3 to 0.9.[18] I finally chose the following set of values for the elasticity respectively regarding wage, real prices of agricultural goods and real prices of non agricultural goods: 0.4, -0.5 and 0.1. This choice is supported by the level of per capita agricultural GDP in the period from 1861 to 1913 (Federico 2003b).

Hence, we can write:

$$Qa = W^{0.4} \cdot P_a^{-0.5} \cdot P_i^{0.1} \tag{6}$$

The final result is presented in Appendix 2, col. 2, and Figure 7.

[17] As also shown by Alvarez Nogal and Prados de la Escosura, in their paper presented at the International Congress of Economic History (Utrecht 2009).

[18] Allen (2000, p. 14); Crafts (1985, p. 39) (0.7); Von Ende and Weiss (1993) (0.6); Jackson (1985) (0.5, with sensitivity tests for the range 0.3–0.9). In all of these calculations crossed elasticity is 0.1.

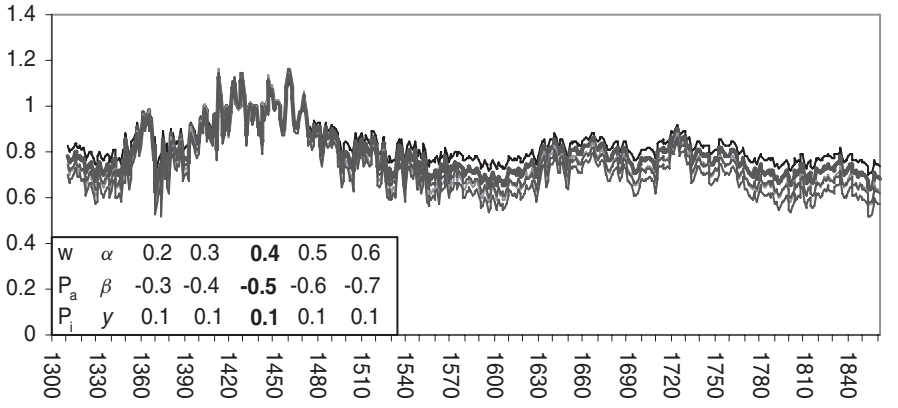


Figure 6. *Sensitivity test of per capita agricultural product 1310–1861 (1420–40 = 1)*

*Source*: see text.
*Note*: data refer to the alternative coefficients of elasticity. The chosen coefficients are represented by the figures and curve in bold.

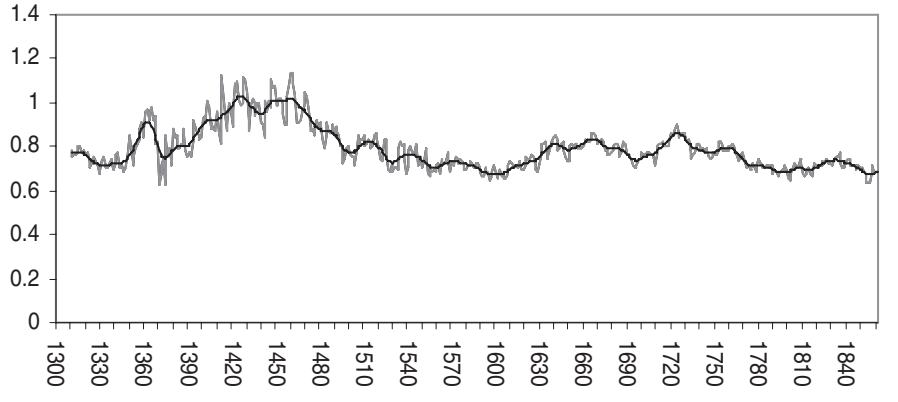


Figure 7. *Index of per capita agricultural GDP 1310–1861 (1420–40 = 1)*

*Source*: see text.
*Note*: the trend is represented by the Hodrick-Prescott filter ($\lambda = 100$).

If a comparison is made between the first half of the fifteenth century, when the curve of per capita agricultural product reached its highest level, and the period between the end of the eighteenth century and the first half of the nineteenth century, we notice a 30 per cent fall. In the first half of the nineteenth century, per capita GDP was 10 per cent lower than in the first

half of the fourteenth century. Decline characterised the trend of agricultural product.

Was this decline counterbalanced by the rise of the non-agricultural sectors?

## 2. Non-agricultural product

### *2.1. Indirect evidence: urbanisation*

For the period before 1861 an estimation of the non-agricultural product is, once again, hard to make from the supply side. Direct information on the level and trend of output in specific industrial sectors and trade in particular cities can only roughly outline the non-agricultural product and is not sufficient for the reconstruction of a continuous series for the centre and north of Italy as a whole. Only from 1861 until the eve of World War I, can we make use of direct series of product in industry (Fenoaltea 2001, 2003b, 2003c, 2006; Ciccarelli and Fenoaltea 2009).

We know that in the thirteenth and early fourteenth centuries Italy, and especially central and northern Italy, was advanced. We also know that industry and trades weakened during the fifteenth century (Lopez and Miskimin 1962; Romano 1971), recovered in the sixteenth century (Braudel 1966), but declined in the seventeenth century (Cipolla 1952; Romano 1971), rising again in the eighteenth and nineteenth centuries, thanks especially to the spread of the silk industry (Federico 1994; Battistini 2003 and 2007, p. 305).

Urbanisation rates reflect this trend; although not perfectly, as will be seen. When considering the centres with over 5,000 inhabitants, in 1330 the urbanisation rate in the part of Italy here in question was 21.4 per cent, while in 1861 it was 16.2 (Table 3, col. A).[19] It diminished in the fifteenth and seventeenth centuries, that is when, as the literature on the topic suggests, the non-agricultural product also diminished, and it continued to do so from 1750 until 1861.

The problem is therefore to quantify output trends outside agriculture. Through a regression of the percentage of the product of the secondary and tertiary sectors on urbanisation rate after Unification (decadal data from 1861 until 1936), we can try to define the necessary coefficients for the estimation of non-agricultural output prior to 1861. After all, urbanisation rates subsequent to 1861 were not far from those of medieval and early modern Italy. The relationship between non-agricultural product ($y_{na}$) and urbanisation ($u$) (percentage) is established through the following linear

[19] On Italian urbanisation see also Bosker, Brakman, Garretsen, De Jong and Schramm (2008).

Table 3. *Urbanisation (A), share of non-agricultural employment out of population (C) and working-age population (D), non-agricultural product out of GDP (B and F) in 1300–1850/61 (%)*

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| | Urbanisation (>5,000) | Regression on urbanisation | Non-agricultural workers on population | Non-agricultural workers on active population | Index of D (1850–61 = 1) | Non-agricultural GDP (%) |
| 1300 | 21.4 | 54.3 | 22.3 | 37.2 | 0.97 | 48.7 |
| 1350 | 17.7 | 47.6 | 20.1 | 33.5 | 0.88 | 43.8 |
| 1400 | 17.6 | 47.4 | 19.6 | 32.7 | 0.86 | 42.8 |
| 1450 | 17.0 | 46.3 | 19.3 | 32.1 | 0.84 | 42.0 |
| 1500 | 21.0 | 53.6 | 22.0 | 36.6 | 0.96 | 47.9 |
| 1550 | 20.0 | 51.7 | 21.4 | 35.6 | 0.93 | 46.6 |
| 1600 | 18.4 | 48.8 | 21.3 | 35.5 | 0.93 | 46.5 |
| 1650 | 15.2 | 43.0 | 19.4 | 32.3 | 0.85 | 42.3 |
| 1700 | 16.9 | 46.1 | 21.3 | 35.5 | 0.93 | 46.5 |
| 1750 | 17.7 | 47.6 | 21.8 | 36.3 | 0.95 | 47.5 |
| 1800 | 17.5 | 47.2 | 22.7 | 37.8 | 0.99 | 49.5 |
| 1850–61 | 16.2 | 50.0 | 22.9 | 38.2 | 1.00 | 50.0 |

*Source*: see text.

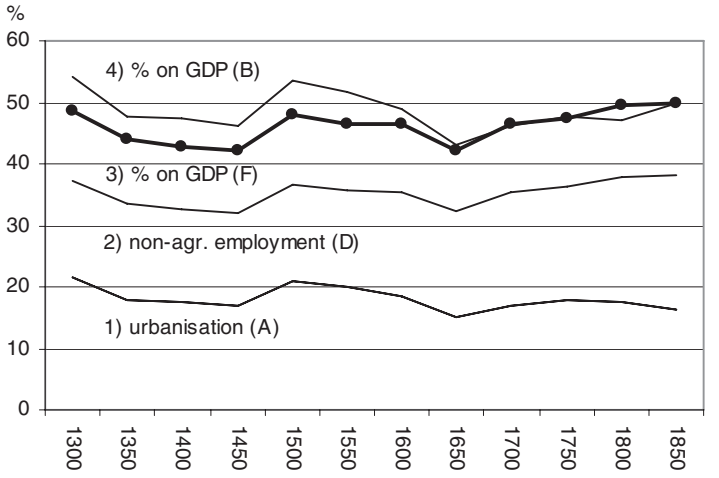


Figure 8. *Urbanisation (1), share of non-agricultural employment out of working-age population (2), non-agricultural product out of GDP (3 and 4) in 1300–1850/61 (%)*

*Source*: see text.
*Note*: (1) urbanisation rates (centres with more than 5,000 inhabitants) (col. A in Table 3); (2) non-agricultural active population (col. D in Table 3); (3) share of non-agricultural GDP (through the series of non-agricultural working age population) (col. C in Table 3); (4) share of non-agricultural GDP (computed through the regression on urbanisation) (col. F in Table 3). The thick curve with the indicators is my choice.

regression:

$$\left(\frac{y_{na}}{y}\right) \cdot 100 = \alpha + \beta u + \varepsilon \tag{7}$$

The result is:[20]

$$\left(\frac{y_{na}}{y}\right) \cdot 100 = 15.371 + 1.82u \tag{8}$$

### *2.2. Indirect evidence: employment*

The results of the estimation based on equation 8 are reported in Table 3 (col. B) and in Figure 8 (4).

[20] P-value (1.134E-05) is low, $R^2$ (0.95) is high (95 per cent confidence). The result hardly changes whenever we include a time trend in the regression 7.

Urbanisation is a good starting point for an estimation of non-agricultural output. It is not enough, however! Despite Italy not being a strong proto-industrial area within Europe, there was no lack of proto-industry (Belfanti 1996). As previously recalled, the progress of the silk industry in particular involved an increase in the number of peasant families in non-agricultural employment (Battistini 1992, 1997, 2003). Raw silk output amounted to 1,300 tons per year in 1700 and reached 3,300 tons in 1850, while the share of central–northern Italy rose from 80 per cent in 1700 to 91 in 1850 (Battistini 2007, pp. 288, 314). While mulberry tree cultivation was a part of agricultural activity, the same did not apply for the several steps involved in the preparation of silk thread, which were industrial activities performed outside the cities.

Furthermore, the equation that correlates the non-agricultural product with urbanisation, based on the post-Unification experience, is influenced by rising productivity in the non agrarian sectors and the presence of non-urban industries (included in $y_{na}/y$) at that time. Whenever used for the Italian economy before the eighteenth century, we run the risk of overrating the Italian non-agricultural activity in the late Middle Ages and early Modern Age. In fifteenth-century Tuscany, only 6 per cent of the rural families were involved in non-agricultural work (Herlihy and Klapisch 1978, ch. X).

Estimates of the non-agricultural rural population are scarce. The one proposed by R. Allen (2000) is plausible in the light of past and recent research. It suggests that the decline of urbanisation was compensated by the rise of the rural non-agricultural population from the late seventeenth century onwards, which reached 38 per cent of the whole workforce in the first half of the nineteenth century (Table 3, cols. C, D).[21] This level is supported by the information from the first censuses in post-Unification Italy, from 1861–71 (Maic 1866, 1876) until 1901 (Vitali 1970). In these censuses, the active population not employed in agriculture was 38–40 per cent of the total active population (Daniele and Malanima forthcoming).[22] We also know that in 1850–61 non-agricultural GDP was around

[21] Allen (2000) reports the shares of population living in the cities and rural population employed in non agricultural jobs. These estimates have been revised in Table 3 (cols. C, D) on the basis of more recent information on population and urbanisation in Italy (Malanima 2005). The estimate of population employed in non-agricultural jobs (Table 3, D) has been computed assuming a working age population equal to 60 per cent of total inhabitants and that any inhabitant in this range is a worker. The topic is discussed in the Appendix 1.3.

[22] One might wonder why the regression of the share of non-agricultural GDP has been done on the urbanisation rate and not directly on non-agricultural population. The choice depends on the fact that data from censuses during the period 1861–1901 only suggest an order of magnitude about the share of non-agricultural population and not a reliable trend (as shown in Daniele and Malanima forthcoming).

50 per cent.[23] It may therefore be established that between 1850 and 1861, 38 per cent of the labour force not employed in agriculture produced half the total output. If we compile an index with base 1861 = 1 (Table 3, col. E) and then multiply the percentage of product 1850–61 (that is 50) by that index, we can establish from 1300 the share of non-agricultural product out of total output. The procedure can be synthesised by the following formula:

$$\frac{Y_{na(t)}}{Y_{(t)}} = \left(\frac{Y_{na(to)}}{Y_{(to)}}\right) \cdot \left(\frac{L_{na(t)}}{L_{na(to)}}\right) \tag{9}$$

where $Y_{na}/Y$ is the share of non agricultural output out of total output (percentage), $L_{na}$ is the share of labour force employed in non-agricultural sectors, $Y_{na}$ the non-agricultural product, and $t_o$ is the period 1850–61 (the base of our index).[24] The same procedure is used for the year $t$ and the years $t$-50, $t$-100 and so on for any half century. The result is a complete series of the share of non-agricultural product, out of total output, in the years of the index (represented by col. F in Table 3 and the thick curve 3 in Figure 8). It may be noted that the series based on the regression on urbanisation, represented in col. B and in Figure 8 by the curve 4, results in a higher level in the late Middle Ages. Two epochs of decline in non-agricultural output, the fifteenth and seventeenth centuries, are confirmed by our results. The recovery from 1750 onwards was supported by proto-industrial activities, especially the rural silk industry; while the role of the cities was of diminishing importance.

## 3. Per capita product

### *3.1. The calculation*

Having computed both $y_a$ and $y_{na}/y$, it is now possible to build the series of per capita product in its yearly values from 1310 until 1861 through the

[23] In the first decade after 1861, the relative importance of the agricultural output in the series by Fenoaltea (2005a, 2005b) is 48–50 per cent. These series are in 1911 prices. In Maddison (1991) the weight of agriculture, in 1870 prices, is 53–54 per cent in the same decade. We still lack a new series in current prices for these years.

[24] So doing, I implicitly assume that labour productivity does not change over the long period 1300–1861. We know that in Italy labour productivity within the cities grew during the high Middle Ages until the fourteenth century (as discussed in Malanima 2002). Later labour productivity rose in the silk industry and perhaps some textile crafts. In services and those crafts devoted to the internal market, such as the building industry, labour productivity did not increase and perhaps diminished (as the trend of real wage rates suggests). Flows of immigration towards the cities favoured some convergence towards similar levels of labour productivity.

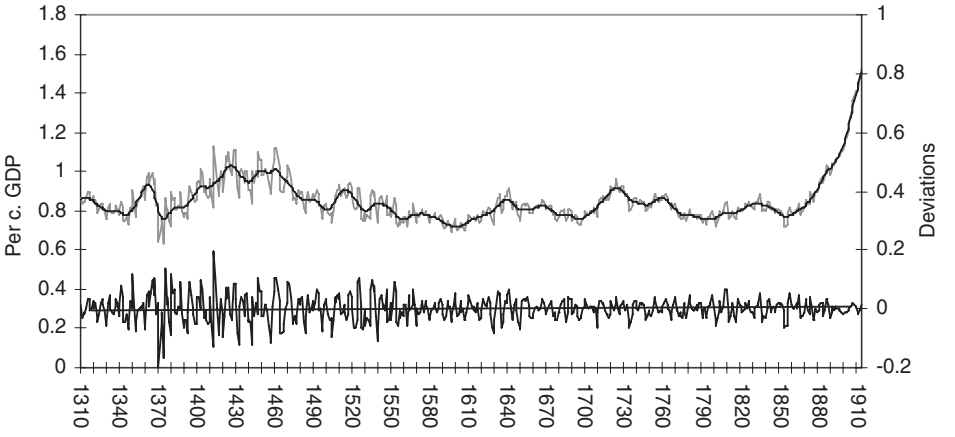


Figure 9. *Per capita GDP in central and northern Italy 1310–1913 (1420–40 = 1)*

*Source*: see text.
*Note*: the trend is represented by the Hodrick-Prescott filter ($\lambda = 100$). The deviations from the trend are reported on the vertical axis on the right side.

following equation, where $(1 - y_{na}) = y_a$:

$$y = \frac{y_a}{[(1 - y_{na})/y]} = \frac{y_a}{(y_a/y)} \tag{10}$$

The result is the complete series of per capita GDP (Appendix 2, cols. 3, 4, 5).[25] In the following graph, it has been connected to a revised series of Italian GDP, over the period 1861–1913, based on the ongoing work of G. Federico (2003a, 2003b) on the Italian agricultural product, of S. Fenoaltea (Fenoaltea 2001, 2003a, 2003b, 2003c, forthcoming) on the industrial product, and the results of V. Zamagni and P. Battilani on services in the years 1891 and 1911 (Zamagni for 1911 and Zamagni and Battilani for 1891, in *I conti economici dell'Italia*). In order to provide a homogeneous series, per capita product from 1861 has only been computed for the north and the centre (on the basis of Daniele and Malanima 2007; Felice 2007). Therefore, the series in the graph is not the national series (Figure 9).

### *3.2. The trend*

The resulting series witnesses a decline of about 20–25 per cent from 1420–40 until the decade between 1860 and 1870. If a comparison is made between

[25] In the annual series of per capita GDP, I utilised a 15-year mobile average of the adjusted values in order to avoid abrupt changes in the series.

Table 4. *Yearly rates of growth of per capita agricultural GDP and per capita GDP 1360–1913 (%)*

| | % agr. GDP | % GDP |
|---|---|---|
| 1360–1430 | 0.16 | 0.13 |
| 1430–1600 | −0.24 | −0.20 |
| 1600–1760 | 0.11 | 0.11 |
| 1760–1855 | −0.17 | −0.12 |
| 1855–1913 | 0.63 | 1.16 |

*Note*: rates of growth are computed from the Hodrick-Prescott trend.

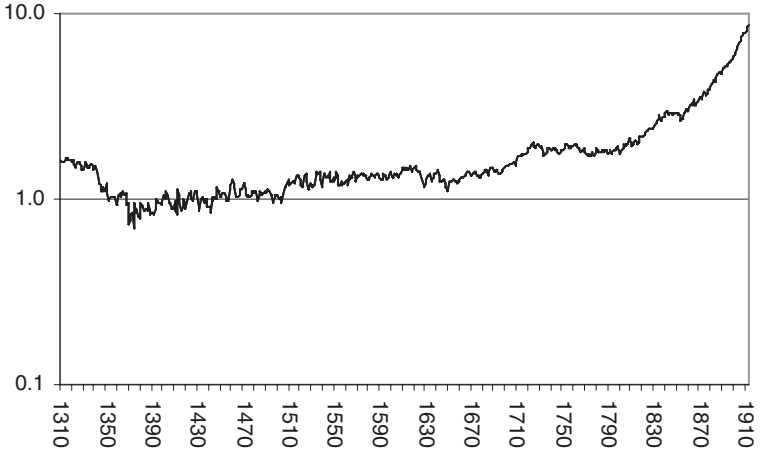


Figure 10. *Index of GDP in Italy CN 1310–1913 (1420–40 = 1; vertical axis in log)*

*Source*: see text.
*Note*: decadal data on population are smoothed through a mobile average.

the beginning of the series in 1310 and the first decade after Unification, the decline is about 10 per cent. This long-term decline was interrupted by two periods of recovery, the fifteenth century, and, albeit more modest, the century between 1650 and 1750 (Table 4). During both periods, the urban sectors declined, while agricultural output per capita grew.

Total product is heavily influenced by population trend. It grew from the second half of the seventeenth century and growth intensified during the nineteenth century, albeit with a period of stability during the second half of the eighteenth century and the first half of the following century (Figure 10).

### *3.3. Three epochs*

If instead of looking at the rates of growth (as in Table 4), we look at the levels of per capita GDP, we single out the following periodisation:

1. *From 1300 until the second half of the sixteenth century:* the period of the *Italian Renaissance*. The Italian economy enjoyed a position of leadership in Europe. Its per capita GDP was high: between 1300 and 1570 the level was around 1,600 international 1990 PPP dollars.
2. *From the second half of the sixteenth century until 1880:* the period of the *Italian decline*. The level was generally 10 per cent lower. It was about 1,400 1990 international dollars in 1690–1710 (and therefore the same as that of the United Kingdom, but lower than that of England and Wales).[26] It was, however, about 30 per cent less than that of England in 1820.[27]
3. *From the 1820s and, more precisely, from the 1880s:* the beginning of *modern growth* in Italy. While per capita GDP was about 1,400 1990 international dollars in 1850–80, it exceeded 2,000 in 1900; was 3,500 immediately after World War II and reached 20,000 in 2005.

In the long-term perspective, the Hodrick-Prescott filter helps single out phases lasting about 100 years (1392–1504; 1504–1606; 1606–98; 1698–1802), cycles of about 30 years and the short-term oscillations, whose intensity declined from the late Middle Ages onward.

### *3.4. The European background*

Data on GDP per head in western Europe help set the Italian case study in a wider perspective as from 1500 (Table 5).[28]

Around 1500, central–northern Italy was the most advanced European region together with the Netherlands. During the sixteenth century, however, its position in the European hierarchy weakened. In 1600, the Netherlands were already much wealthier than Italy, while Spain also enjoyed a higher level of per capita GDP.[29] During the two following centuries, Italy not

[26] Crafts and Harley (1992) and Maddison (2001), p. 247. In 1700 urbanisation rate was also the same in England and Italy (Malanima 2010).

[27] See the similar declining trend in Alvarez-Nogal and Prados de la Escosura (2007).

[28] Data in Table 7 have been built with a method similar to that used in this article. These series are similar to those proposed by Alvarez Nogal and Prados de la Escosura (2007a) and Van Zanden (2001, 2005) (although Van Zanden's level is lower). All these series witness a stability in per capita GDP from 1500 until about 1800 and do not share the optimistic view presented by Maddison (2001, 2003, 2007) on the slow growth of the period. See also the comments to Maddison by Federico (2002). On the long-term trend, see also Lo Cascio and Malanima (2009).

[29] On Spanish GDP per capita see also the analysis by Carreras (2009).

Table 5. *Per capita GDP in six European countries and the whole of Europe 1500–1870 (1990 international Geary-Khamis dollars PPP) in A; indices 1 = 1500 in B and 1 = 1800 England in C*

| A | England | Netherlands | Spain | Italy (CN) | France | Germany | *Europe* |
|---|---|---|---|---|---|---|---|
| 1500 | 1.420 | 1.600 | 1.460 | 1.550 | 1.330 | 1.220 | *1.350* |
| 1600 | 1.350 | 1.860 | 1.440 | 1.350 | 1.300 | 1.150 | *1.250* |
| 1700 | 1.890 | 2.160 | 1.430 | 1.440 | 1.440 | 1.210 | *1.390* |
| 1750 | 2.150 | 2.260 | 1.310 | 1.560 | 1.490 | 1.250 | *1.440* |
| 1800 | 2.010 | 2.050 | 1.290 | 1.430 | 1.410 | 1.260 | *1.350* |
| 1870 | 3.490 | 2.760 | 1.370 | 1.600 | 1.880 | 1.840 | *1.970* |
| B | England | Netherlands | Spain | Italy (CN) | France | Germany | *Europe* |
| 1500 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | *1.00* |
| 1600 | 0.95 | 1.16 | 0.99 | 0.87 | 0.98 | 0.94 | *0.93* |
| 1700 | 1.33 | 1.35 | 0.98 | 0.93 | 1.08 | 0.99 | *1.03* |
| 1750 | 1.51 | 1.41 | 0.90 | 1.01 | 1.12 | 1.02 | *1.07* |
| 1800 | 1.42 | 1.28 | 0.88 | 0.92 | 1.06 | 1.03 | *1.00* |
| 1870 | 2.46 | 1.73 | 0.94 | 1.03 | 1.41 | 1.51 | *1.46* |
| C | England | Netherlands | Spain | Italy (CN) | France | Germany | *Europe* |
| 1500 | 0.71 | 0.80 | 0.73 | 0.77 | 0.66 | 0.61 | *0.67* |
| 1600 | 0.67 | 0.93 | 0.72 | 0.67 | 0.65 | 0.57 | *0.62* |
| 1700 | 0.94 | 1.07 | 0.71 | 0.72 | 0.72 | 0.60 | *0.69* |
| 1750 | 1.07 | 1.12 | 0.65 | 0.78 | 0.74 | 0.62 | *0.72* |
| 1800 | **1.00** | 1.02 | 0.64 | 0.71 | 0.70 | 0.63 | *0.67* |
| 1870 | 1.74 | 1.37 | 0.68 | 0.80 | 0.94 | 0.92 | *0.98* |

*Source*: Malanima (2009, ch. VI).

only lost its primacy, but also declined in absolute terms, while England strengthened its position and the Netherlands still held their supremacy. Against a stable European background, the centre, represented by France and Germany, hardly progressed; the north, that is the Netherlands and England, gained and the Mediterranean countries, Spain and north Italy, weakened.[30] In a European perspective, Italy, like Spain (Alvarez-Nogal and Prados de la Escosura 2007, p. 359) exhibited a sustained decline.

The series of per capita GDP shows a clear upward trend from the 1880s on, which has recently been noticed by G. Federico (2003a, 2003b) and S. Fenoaltea (2002). From then until the eve of World War I, product per head rose by 90 per cent in the centre and north and by 75 per cent on the national scale. The level reached by per capita GDP in the fifteenth century was surpassed around the year 1900.

Table 6 helps set Italy (all of Italy, not only the centre and north) in the western European context between 1870 and 1911.

[30] Although some differences exist between the series in Table 7 and those provided by Alvarez Nogal and Prados de la Escosura (2007a, table 16), the European weighted average is quite similar. Taking 1500 = 1, their index of per capita GDP in 1600 is 0.98, 1700 1.02, 1750 1.08, 1800 1.07, 1850 1.42.

Table 6. *Per capita GDP in Italy and Western European nations in 1870 and 1911 (Geary-Khamis 1990 PPP international dollars)*

| | 1870 | 1911 |
|---|---|---|
| United Kingdom | 3,190 | 4,709 |
| Netherlands | 2,757 | 3,888 |
| Belgium | 2,692 | 4,148 |
| Switzerland | 2,102 | 4,378 |
| Denmark | 2,003 | 3,857 |
| France | 1,876 | 3,250 |
| Austria | 1,863 | 3,365 |
| Germany | 1,839 | 3,408 |
| Sweden | 1,662 | 3,002 |
| Italy | 1,635 | 2,571 |
| Norway | 1,360 | 2,255 |
| Finland | 1,140 | 1,939 |

*Note*: the source of the table is Maddison (2003). Data for Italy are those of app. II, cols. III and IV. The position of Italy in the hierarchy is hardly different using the database by Prados de la Escosura (2000).

We can now distinguish the two main phases of the long history, from 1300 until today (Figure 11), and the rise in productive capacity in the 150 years preceding the recent reduction of the rate of growth. While decline has characterised the Italian economy from the Renaissance onwards, per capita GDP rose 16 times between 1861 and 2005 in the centre and north, 14 times on the national scale in this same period, and 9.5 times in the south and the islands.

## 4. Conclusion

Italy is one among the few European regions for which we have long series of prices, wages and urbanisation: from as far back as the beginning of the fourteenth century. Another advantage is that both its population level and trend from the late Middle Ages are relatively well known. Only in the case of England is it possible to go as far back in time. Recent work has allowed the elaboration of the long series presented in the previous pages. These series already suggest the trend of the Italian economy. The method proposed in the previous pages is, in a sense, a condensed outline of all this information.

The result is a slowly declining profile supporting the pessimistic view of the European pre-modern economy. Italy was rich during the Renaissance, when its population was 7–12 million (4–8 million in the centre–north), but was poor at the end of the Renaissance, in the second half of the sixteenth century. It recovered in the seventeenth century, when the population was 11–13 million (6.6–8 million in the centre–north), but became poor once more from half way through the eighteenth century, while the population

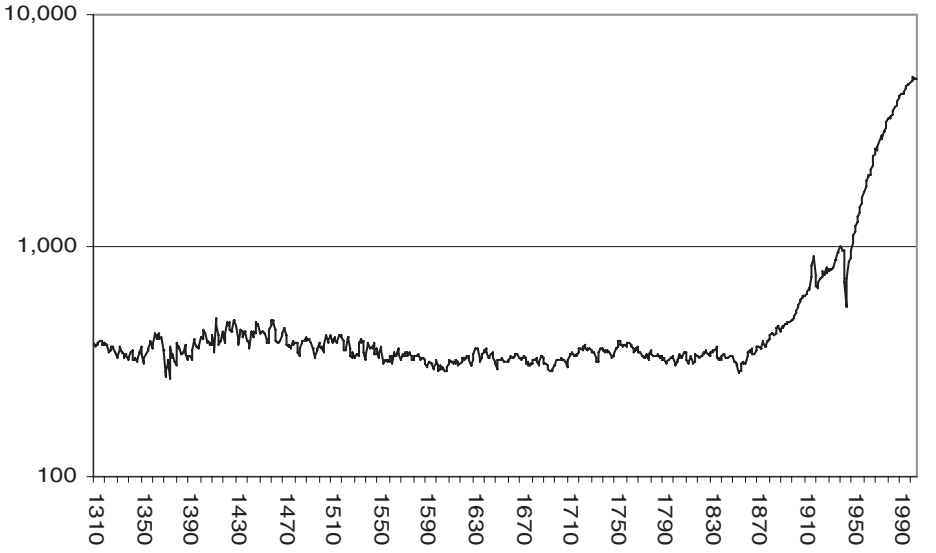


Figure 11. *Per capita GDP 1310–2005 in central and northern Italy (1911 prices; vertical axis in log)*

*Sources*: see text and Daniele and Malanima (2007), for the period 1861–2005.

grew to 18 million in 1800 and 26 million in 1861 (16 million in the centre–north). Italy came back to the centre of the European economy during the second Industrial Revolution, in the last decades of the nineteenth century, and was able to strengthen its position in the economic world hierarchy only after the middle of the past century (Zamagni 1993; Malanima and Zamagni 2010).

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## Appendix 1: Three tests

Three tests are presented in the following pages:

1. conversion of per capita GDP into current prices and comparison of the results with quantitative information on the late medieval and early modern ages;
2. the method followed for the period 1300–1861 is used for the period 1861–1913 and the results are compared with the available series based on direct information;
3. the internal consistency of our procedure is tested through the calculation of yearly marginal product, then compared to the series of real wage rates.

### A1.1. Current prices

The first test of our results consists in the conversion of the output series into current prices for the long period in question and the comparison of the results with the direct information available on prices, incomes, taxes, consumptions etc. This test is always recommended when historical series of GDP are elaborated. We must provide future scholars with the possibility of easily comparing their results with ours and, when necessary, modify our series.

The series in Florentine lire is reported in Appendix 2, col. 7, together with the formula used for its calculation and the weight of the Florentine lira (col. 8) to

Table A1.1. *Poverty line and per capita GDP 1360–1870 (current prices; Florentine lire)*

| | A<br>Poverty line (current prices) | B<br>Per c. GDP (current prices) | A/B | B/A |
|---|---|---|---|---|
| 1360–70 | 23.5 | 52.3 | 0.45 | 2.22 |
| 1460–70 | 26.3 | 64.8 | 0.41 | 2.44 |
| 1580–90 | 81.1 | 148.8 | 0.55 | 1.81 |
| 1770–80 | 126.6 | 185.5 | 0.68 | 1.47 |
| 1860–70 | 210.9 | 329.0 | 0.64 | 1.56 |

*Source*: Malanima (2003).

allow the conversion into the different currencies of central–northern Italy and also non-Italian countries.

Although for the long period under examination several comparisons with data in current money would be possible,[31] only three examples are presented here.

A first comparison is made with a poverty line, based on a basket including essential food (about 2,000 kilocalories), especially cereals (mainly minor cereals) and a limited yearly expense for textiles and housing (Malanima 2003). It is about 700–800 Geary-Khamis 1990 international dollars. This poverty line is about half the Italian per capita product for the long epoch in question; closer to the level of per capita output in the last phase and farther from that in the late Middle Ages (Table A1.1).

A second comparison is made between our series and direct information relating to the period between 1420 and 1450. For the Republic of Florence, both the Catasto and information on prices and wages, together with the statistical calculations by Lodovico Ghetti (1816),[32] led historians (Herlihy and Klapisch 1978; Rutenburg 1988; Goldthwaite 1980; Goldsmith 1987, pp. 145ff.) to suggest a value of per capita income between 55 and 75 Florentine lire, estimated from the consumption side. 'This estimate is not out of line with the 14 florins (or 56 lire) that the Catasto officials considered the cost of maintenance of a single adult' (Goldthwaite 1980, p. 348). Our average is 64 lire in 1420–40.

A third comparison can be made with the fiscal revenue of 1492 and 1852 in the centre and the north. For the fifteenth century, we have information on fiscal revenue issued by the Italian states in the year 1492 (Felloni 1999, p. 256; Malanima 2002, ch. 6). For the centre and the north, these amounted to about 17,500,000 Florentine lire. According to our series this value corresponds to a plausible fiscal pressure of about 5 per cent in the decade 1485–95. We know that the fiscal pressure in the Italian northern and central states in 1852 was 352,887,000 Italian lire (Correnti and Maestri 1864, II, pp. 616–17): about 7 per cent of gross output; that is a little higher than at the end of the fifteenth century.

[31] See Malanima (2002, app. V).

[32] Lodovico Ghetti wrote his text in 1430–40.

Table A1.2. *Rates of growth of four series of per capita GDP 1861–1913 (% per year)*

| | Maddison | Fenoaltea | Malanima 1 | Malanima 2 |
|---|---|---|---|---|
| 1861–76 | 0.22 | 0.53 | 0.46 | 0.24 |
| 1877–88 | 0.90 | 1.05 | 1.43 | 2.20 |
| 1889–99 | 0.61 | 0.57 | 0.96 | 1.29 |
| 1900–13 | 2.64 | 1.76 | 2.01 | 1.72 |
| ***1861–1913*** | **1.07** | **0.97** | **1.18** | **0.96** |

*Sources*: Maddison (1991); Fenoaltea (2005a, 2005b); Malanima (2006a); see text for Malanima 2.
*Note*: the four series are the same as those presented in the previous graph and reported in Appendix 3.

## A1.2. The period 1861–1913

Our results can also be tested by reconstructing the output for the period following the end of our series, using the same methods as for the period 1300–1861. Here I will refer to the whole of Italy and not only the centre and north, and will use series of prices and wages[33] elaborated by statisticians and historians for the years 1861–1913. Our results then can be compared with those recently reached in the revision of product from Unification until World War I.

The series of agricultural product has been recently worked out by G. Federico (2003a, 2003b) and is not yet definitive. Series for industry have almost been completed by S. Fenoaltea. Services are only known for the years 1891 and 1911, thanks to the research of V. Zamagni and P. Battilani.

The available series of GDP in the years 1861–1913 are, however, still conjectural, although certainly much better than the old Istat series (Istat 1976; Ercolani 1969; Vitali 1991). S. Fenoaltea has recently defined his own series of GDP, published in 2005, 'premature in every sense' (Fenoaltea 2005a, 2005b). Even his revision of these series is only likely to provide 'highly preliminary, frankly conjectural ersatz-third-generation production series' (Fenoaltea, forthcoming).

The series calculated through equations (6) – agriculture – and (8) – non-agricultural sectors –[34] (the thick curve, number 2, in Figure A1.1) is not so dissimilar to the series presented by Fenoaltea (2005a, 2005b), the alternative proposed by Malanima (2006) (number 1 in the graph) and that by Maddison (1991), based on the previous Istat series and on the series by O. Vitali (in Ercolani 1969).

Differences between the yearly rates of growth of these four series are presented in Table A1.2.

[33] Wages and the index of prices are from Fenoaltea (2002), while series of agricultural and non-agricultural prices are from Barberi (1961, pp. 129 and 203).

[34] Employment per sector in the comparatively brief period 1861–1911 is relatively stable. Data are not very reliable. We have then used the series of urbanisation and the equation (10). In fact, doubts on the results when we are using this equation concern the late medieval and early modern period. From 1700, curves 3 and 4 of Figure 9 coincide.

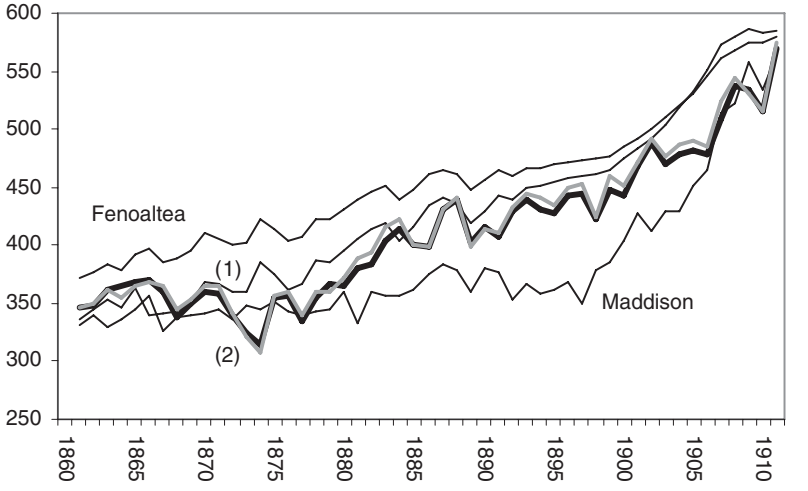


Figure A1.1. *Estimates of per capita GDP in Italy 1861–1911 (1911 prices)*

*Sources*: Maddison (1991); Fenoaltea (2005a, 2005b); Malanima (2006a and 2006b); see text for Malanima 2.
*Note*: the three series represented in the graph (Maddison, Fenoaltea and (1)) are reported in Appendix 3. The grey curve refers to the indirect method of estimating GDP taking into account net imports of agricultural goods.

The series seems to capture well long-run trend. As to short-run fluctuations, the series reveals the 1873 crisis, the 1881–7 growth, the crisis from 1888 until 1895 and the recovery after 1895. Short-term trend corresponds well to the conjuncture recorded by coeval observers (Bachi 1914, pp. 298–313). The higher volatility suggested by this series from 1890 onwards is not necessarily less plausible than the smooth profile resulting from the direct reconstruction.[35]

Since, as already seen, a demand-side approach assumes equality between demand and production of agricultural goods, the reliability of this assumption for a period after Unification, when the importation of agricultural goods and especially cereals was significant, can also be tested. Thus, the difference between importation and exportation of agricultural goods is added to our curve of product.[36] The grey curve in the graph represents the result, which determines a negligible difference from the curve obtained through the procedure followed in this article. This analysis does not dismiss the assumption of equality between demand for agricultural goods and the agrarian product.

[35] The indirect method could capture short-run fluctuations better than direct methods.
[36] A new, still unpublished series of the Italian trade from 1863 was kindly given to me by G. Federico. I take the opportunity of thanking him.

## A1.3. Working time

While previous analyses are useful to check the correlation between our results and data proposed by coeval observers or modern historians, the following one is aimed at demonstrating the *internal consistency* of our series by using it to calculate marginal and average product, the ratio of wages to GDP and, finally, working time and its elasticity to wage rate.[37] Previous results are used in order to analyse, in a circular way, their internal compatibility from a theoretical and empirical viewpoint.

Since our series of GDP is annual, the yearly marginal product of labour can be calculated on its basis. Then, dividing it by the wage rate per day, we obtain the number of days worked in a year. The denominator, the wage rate, has also been employed to define the nominator. However, the nominator, that is the yearly marginal product of labour, has been calculated using the series of wage rates, together with series of prices, coefficients of elasticity and finally data on employment.

Formally our procedure consists in solving the following equation:

$$t = \frac{\partial Y}{\partial L} / W \tag{11}$$

where: $t$ are the working days in a year; $\partial Y/\partial L$ is the yearly marginal product of labour (the partial derivative of output as to labour force) and $W$ is wage rate per day. According to the theory, in pre-modern backward economies, the relationship of wage rate to working days, is inverse. We would therefore expect to find a negative elasticity of labour supply to changes in wage per day.[38]

It is known that population between 15 and 65 years of age was about 55–65 per cent in pre-modern Italy (Beloch 1937–61, vol. I, ch. I). Almost everybody in this age group worked, although with different intensity, thus devoting more or less time to work.[39] In the first Italian national census in 1861, 62 per cent of the population was at working age and 96 per cent of this share was employed (Daniele and Malanima forthcoming). I have therefore assumed that labour ($L$) is equal to 60 per cent of the whole population.

The relationship between GDP and labour is represented in Figure A1.2.

The best interpolating curve is represented by the following power equation:[40]

$$Y = 451.8L^{0.785} \tag{12}$$

[37] In the following calculations I use decadal averages to simplify the procedure.

[38] However, this inverse relationship can be mitigated by the decrease of resources and capital per worker when population is particularly dense and wage rate low.

[39] A more correct procedure would be to specify the labour force as a percentage of the working age population. For a pre-modern economy, however, it is plausible to assume the entire working age population as the labour force. This assumption implies that, in our calculations, the percentage of workers out of the total population is made up by the population between 15 and 65 years, and that what actually changes is the intensity of their work: there are no unemployed, but only different labour intensities.

[40] The results of the regression of: $\ln Y = c + \ln L + \varepsilon$ are represented by equation 12: ($R^2 = 0.92$), P-value 2.33E-26 (95 per cent confidence).

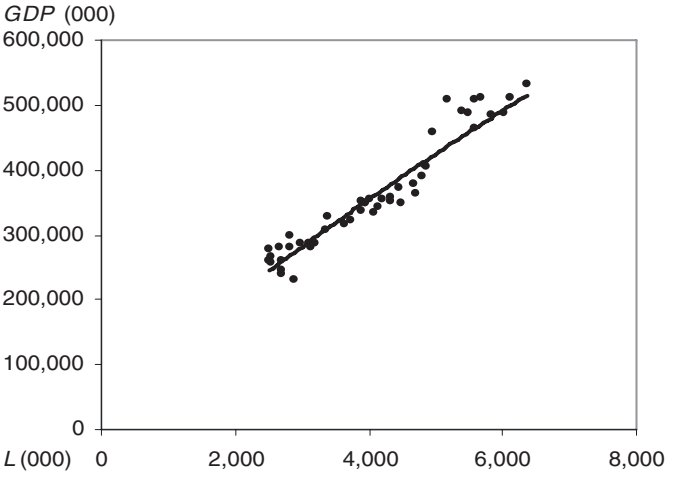


Figure A1.2. *Output (in 1420–40 Florentine lire) and active population 1350–1820 (000; decadal data)*

*Source*: see text.

The yearly marginal product of labour can be computed as the partial derivative, that is:

$$\frac{\partial}{\partial L}\left(451.8L^{0.785}\right) = 363.16L^{-0.215} \tag{13}$$

The series of the annual marginal product of labour can now be calculated. The resulting ratio between marginal and average labour product, which is the relative weight of wage as a form of income, is 69 per cent, that is:

$$\frac{\partial Y}{\partial L}\Big/\frac{Y}{L} = 0.69 \tag{14}$$

It is now hard to assess the average wage rate (the denominator of our previous equation 11). Our estimated average between the wage rate of a mason and that of an agricultural worker is only an approximation and nothing more. As a consequence, we can not hope to find the true level of days worked in Italy in the long period under examination, but only to suggest an order of magnitude and a plausible trend.

The result of equation 11 provides the average number of working days: 183 per year during the period from the fourteenth century to the beginning of the nineteenth century. This average may seem too low when compared to what we know about working time in northern Europe (summarised by de Vries 2008, pp. 73ff.). However, it must be considered that the results referring to working days would be higher if reliable figures were available for the part of the population actually employed, instead of assuming, as I have, that the entire population of a working age, i.e. 60 per cent of the total, were employed. Our purpose is, however, to draw the trend rather than the level of days of work (which is difficult to specify in

Table A1.3. *Implicit working time in our GDP calculation 1350–1820 (days per year)*

| | Days of work |
|---|---|
| 1350–1400 | 161 |
| 1400–50 | 120 |
| 1450–1500 | 136 |
| 1500–50 | 206 |
| 1550–1600 | 250 |
| 1600–50 | 204 |
| 1650–1700 | 169 |
| 1700–50 | 165 |
| 1750–1800 | 200 |
| 1800–20 | 210 |

*Source*: see text.

any case). Nevertheless, the result that working time was low in the fifteenth century (about 120–36 days per year) is plausible (Table A1.3).

The number of working days rose conspicuously in the sixteenth century, in conjunction with the decline in real wage rates, until 1550–1600.[41] A drop occurred in the seventeenth century, but the days of work rose again in the second half of the eighteenth century together with the decline in real wage rates, without, however, ever reaching the level of the sixteenth century. From the beginning of our curve, in the second half of the fourteenth century, to the end, days of work increased from about 150 to 200. As the English evidence seems to suggest this trend is probably the same as that which is to be found in other European regions over the same period (Voth 1998, 2001). An 'industrious revolution' was in progress in Italy and in northern Europe, determined by the need to survive. People were forced to be industrious.[42]

The working time-wage relationship is negative, as expected, and the most appropriate equation is a second degree polynomial where $t$ are days of work and $W$ real wage per day (1420–40 Florentine lire):[43]

$$t = 957.88\,W^2 - 1155\,W + 462.88 \tag{15}$$

Elasticity can be here defined by the following equation:

$$\eta = \frac{\partial t}{\partial W} \cdot \frac{W}{t} \tag{16}$$

where:

$$\frac{\partial t}{\partial w} = 1915.76w - 1155 \tag{17}$$

[41] Sella (2008) collects information on labour intensification in northern Italy in the sixteenth and first half of the seventeenth century.

[42] De Vries (1994) and (2008) has always stressed the importance of a market determinant of labour intensification in seventeenth- and eighteenth-century Europe.

[43] P-value for $W^2$ (6.49E-12) and $W$ (4.45E-17) is low, $R^2$ (0.95) is high (95 per cent confidence).

Elasticity is not the same at different levels of wage rate. It is relatively high (from -0.70 to -0.75) when the daily wage is low (around 0.25 1420–40 Florentine lire) and low (from –0.40 to –0.45) when wage rate is high (around 0.55 Florentine lire). Similar elasticity coefficients have been found in the Philippines, Egypt and India (Dessing 2002; Assaad and El-Hamidi 2002; Sharif 1991).

## Appendix 2: Per capita GDP in central–northern Italy, 1310–1913

The following series refer to the most developed regions of the country: the centre and the north (from the southern borders of Tuscany, Umbria, Marche until the Alps; 161,000 km$^2$ out of the total of 310,000 km$^2$). See Appendix 3 for the series concerning the whole of Italy in 1861–1913. In 1420–40 the average value of per capita agricultural GDP is 246 1911 lire. This value allows the calculation of the series of per capita agricultural output in 1911 lire and the comparison with the series of GDP in col. 5.

In www.paolomalanima.it (section on the Italian economy) you find information on the procedure used to build the basic Italian series of prices, wages, urbanisation, and population for the calculation of output.

In order to convert the series into 1990 international Geary-Khamis dollars PPP and make comparisons with other countries and with data provided by A. Maddison, the index in column 4 has only to be multiplied by 1,486 (the value of 1861 per capita GDP in this nominal money). In col. 9 the results of the Hodrick-Prescott filter are reported and can be used as average values to smooth the index of GDP in col. 3.

A conversion of the entire series into current prices is useful to make comparisons with data expressed in the currency of any Italian state. In the following col. 7, the nominal money chosen is the Florentine lira (whose weight is reported in col. 8 on the basis of Goldthwaite 1980, pp. 429–30). Conversions into the currencies of other Italian states can be made through the weight in silver of any currency. I have chosen the decade before Unification; when the currencies of the Italian states still existed. They were replaced by the Italian lira (4.5 silver grams) from 1861 onward. Then the result is multiplied by the consumer price index and subsequently by the index of per capita GDP. The procedure in order to convert per capita GDP in 1861 lire into the Florentine current lire is summarised by the following equation:

$$y_t^f = \left( \frac{y_t^n \cdot s_t^n}{s_t^f} \right) \cdot i_t^p \cdot i_t^y$$

where:

$y_t^f$ is per capita GDP in Florentine (*f*) lire in the year *t;*
$y_t^n$ per capita GDP in national (*n*) Italian lire in the year *t*;
$s_t^n$ the weight in silver of the Italian lira in the *t* year;
$s_t^f$ the weight in silver of the Florentine lira in the same year;
$i_t^p$ the index of prices and $i_t^y$ the index of per capita GDP in the *t* year.

The year chosen as the basis of this reconstruction is 1861 and the same procedure is used for the years *t*–1 (1860), *t*–2 (1859)... *t*–n.

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1310 | 0.67 | 0.78 | 0.87 | 1.12 | 372 | 1.63 | 38.2 | 19.0 | 0.86 |
| 1311 | 0.82 | 0.75 | 0.84 | 1.07 | 358 | 1.57 | 45.0 | 19.0 | 0.86 |
| 1312 | 0.77 | 0.76 | 0.85 | 1.09 | 363 | 1.60 | 42.9 | 19.0 | 0.86 |
| 1313 | 0.77 | 0.76 | 0.85 | 1.09 | 363 | 1.60 | 42.9 | 19.0 | 0.86 |
| 1314 | 0.72 | 0.78 | 0.87 | 1.11 | 370 | 1.62 | 40.8 | 19.0 | 0.86 |
| 1315 | 0.64 | 0.80 | 0.89 | 1.14 | 381 | 1.67 | 37.6 | 19.0 | 0.86 |
| 1316 | 0.64 | 0.80 | 0.89 | 1.14 | 381 | 1.67 | 37.6 | 19.0 | 0.86 |
| 1317 | 0.74 | 0.77 | 0.86 | 1.10 | 366 | 1.61 | 41.9 | 19.0 | 0.86 |
| 1318 | 0.74 | 0.77 | 0.86 | 1.10 | 366 | 1.61 | 41.9 | 15.7 | 0.86 |
| 1319 | 0.69 | 0.78 | 0.87 | 1.12 | 373 | 1.64 | 39.7 | 15.7 | 0.85 |
| 1320 | 0.64 | 0.76 | 0.85 | 1.09 | 363 | 1.59 | 35.8 | 15.7 | 0.85 |
| 1321 | 0.62 | 0.77 | 0.86 | 1.10 | 367 | 1.61 | 34.8 | 15.7 | 0.84 |
| 1322 | 0.77 | 0.73 | 0.81 | 1.04 | 348 | 1.53 | 41.1 | 15.7 | 0.83 |
| 1323 | 0.89 | 0.71 | 0.79 | 1.01 | 337 | 1.49 | 46.3 | 15.7 | 0.83 |
| 1324 | 0.79 | 0.73 | 0.81 | 1.04 | 345 | 1.52 | 42.1 | 15.7 | 0.82 |
| 1325 | 0.69 | 0.75 | 0.83 | 1.07 | 356 | 1.57 | 37.9 | 15.7 | 0.82 |
| 1326 | 0.67 | 0.75 | 0.84 | 1.08 | 359 | 1.59 | 36.9 | 15.7 | 0.81 |
| 1327 | 0.74 | 0.74 | 0.82 | 1.05 | 350 | 1.55 | 40.0 | 15.7 | 0.81 |
| 1328 | 0.84 | 0.72 | 0.80 | 1.02 | 341 | 1.51 | 44.2 | 15.7 | 0.80 |
| 1329 | 1.14 | 0.68 | 0.75 | 0.97 | 322 | 1.43 | 56.8 | 15.7 | 0.80 |
| 1330 | 1.07 | 0.68 | 0.76 | 0.97 | 324 | 1.44 | 53.4 | 15.7 | 0.80 |
| 1331 | 0.74 | 0.73 | 0.82 | 1.05 | 348 | 1.54 | 39.8 | 15.7 | 0.80 |
| 1332 | 0.67 | 0.75 | 0.84 | 1.07 | 357 | 1.58 | 36.7 | 15.7 | 0.80 |
| 1333 | 0.82 | 0.72 | 0.80 | 1.02 | 341 | 1.50 | 42.9 | 15.7 | 0.80 |
| 1334 | 0.87 | 0.71 | 0.79 | 1.01 | 337 | 1.48 | 45.0 | 15.7 | 0.80 |
| 1335 | 0.89 | 0.70 | 0.78 | 1.01 | 335 | 1.46 | 46.1 | 15.7 | 0.80 |
| 1336 | 0.78 | 0.72 | 0.81 | 1.03 | 344 | 1.50 | 41.6 | 15.7 | 0.80 |
| 1337 | 0.71 | 0.74 | 0.83 | 1.06 | 353 | 1.53 | 38.4 | 15.7 | 0.80 |
| 1338 | 0.74 | 0.73 | 0.81 | 1.04 | 347 | 1.50 | 39.4 | 15.7 | 0.80 |
| 1339 | 0.95 | 0.70 | 0.78 | 1.00 | 332 | 1.43 | 48.7 | 15.7 | 0.80 |
| 1340 | 0.77 | 0.72 | 0.81 | 1.03 | 344 | 1.47 | 40.8 | 15.7 | 0.79 |
| 1341 | 0.61 | 0.76 | 0.85 | 1.09 | 363 | 1.51 | 34.3 | 15.7 | 0.79 |
| 1342 | 0.60 | 0.77 | 0.82 | 1.05 | 349 | 1.40 | 31.6 | 15.7 | 0.79 |
| 1343 | 0.88 | 0.70 | 0.75 | 0.96 | 319 | 1.24 | 42.7 | 15.7 | 0.78 |
| 1344 | 0.88 | 0.70 | 0.75 | 0.96 | 319 | 1.20 | 42.4 | 15.7 | 0.78 |
| 1345 | 0.77 | 0.72 | 0.77 | 0.98 | 327 | 1.19 | 38.3 | 12.3 | 0.78 |
| 1346 | 1.02 | 0.69 | 0.73 | 0.94 | 311 | 1.10 | 48.2 | 12.3 | 0.78 |
| 1347 | 0.95 | 0.70 | 0.75 | 0.96 | 319 | 1.09 | 46.1 | 11.1 | 0.79 |
| 1348 | 0.82 | 0.76 | 0.81 | 1.04 | 348 | 1.15 | 43.1 | 11.1 | 0.79 |
| 1349 | 0.88 | 0.75 | 0.80 | 1.03 | 343 | 1.10 | 45.8 | 11.1 | 0.80 |
| 1350 | 0.72 | 0.85 | 0.91 | 1.16 | 387 | 1.21 | 42.5 | 11.1 | 0.81 |
| 1351 | 1.07 | 0.78 | 0.83 | 1.07 | 356 | 1.09 | 58.0 | 11.1 | 0.82 |
| 1352 | 1.64 | 0.72 | 0.76 | 0.98 | 327 | 0.97 | 81.2 | 10.8 | 0.83 |
| 1353 | 1.33 | 0.76 | 0.80 | 1.03 | 343 | 1.00 | 69.3 | 10.8 | 0.84 |
| 1354 | 0.93 | 0.80 | 0.85 | 1.09 | 362 | 1.03 | 51.1 | 10.8 | 0.85 |
| 1355 | 0.90 | 0.81 | 0.87 | 1.11 | 370 | 1.03 | 50.5 | 10.8 | 0.87 |
| 1356 | 0.86 | 0.83 | 0.89 | 1.14 | 379 | 1.03 | 49.7 | 10.8 | 0.88 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1357 | 0.78 | 0.88 | 0.89 | 1.15 | 382 | 1.02 | 44.6 | 10.8 | 0.89 |
| 1358 | 0.75 | 0.91 | 0.92 | 1.18 | 394 | 1.03 | 44.0 | 10.8 | 0.90 |
| 1359 | 0.94 | 0.84 | 0.85 | 1.09 | 364 | 0.93 | 51.0 | 10.8 | 0.91 |
| 1360 | 0.96 | 0.86 | 0.88 | 1.13 | 375 | 0.94 | 53.9 | 10.8 | 0.92 |
| 1361 | 0.75 | 0.96 | 0.98 | 1.25 | 416 | 1.05 | 46.8 | 10.8 | 0.93 |
| 1362 | 0.71 | 0.97 | 0.99 | 1.27 | 422 | 1.07 | 45.1 | 10.8 | 0.93 |
| 1363 | 0.86 | 0.92 | 0.94 | 1.20 | 400 | 1.02 | 51.2 | 10.8 | 0.93 |
| 1364 | 0.77 | 0.95 | 0.97 | 1.24 | 414 | 1.06 | 47.4 | 10.8 | 0.92 |
| 1365 | 0.74 | 0.98 | 1.00 | 1.28 | 426 | 1.10 | 47.2 | 10.8 | 0.91 |
| 1366 | 0.87 | 0.92 | 0.93 | 1.20 | 399 | 1.04 | 52.1 | 10.8 | 0.89 |
| 1367 | 0.79 | 0.94 | 0.96 | 1.23 | 411 | 1.07 | 48.8 | 10.8 | 0.87 |
| 1368 | 1.24 | 0.82 | 0.83 | 1.07 | 355 | 0.93 | 65.9 | 10.8 | 0.85 |
| 1369 | 1.21 | 0.83 | 0.84 | 1.08 | 359 | 0.95 | 64.9 | 10.8 | 0.82 |
| 1370 | 1.55 | 0.63 | 0.64 | 0.82 | 273 | 0.73 | 63.4 | 10.8 | 0.80 |
| 1371 | 1.22 | 0.67 | 0.68 | 0.88 | 292 | 0.77 | 53.3 | 10.8 | 0.78 |
| 1372 | 1.01 | 0.72 | 0.73 | 0.93 | 311 | 0.82 | 47.0 | 10.8 | 0.77 |
| 1373 | 0.95 | 0.74 | 0.76 | 0.97 | 323 | 0.84 | 45.7 | 10.8 | 0.76 |
| 1374 | 1.75 | 0.62 | 0.63 | 0.81 | 270 | 0.70 | 70.7 | 9.6 | 0.76 |
| 1375 | 1.24 | 0.85 | 0.87 | 1.11 | 371 | 0.96 | 68.9 | 9.6 | 0.76 |
| 1376 | 0.91 | 0.77 | 0.78 | 1.00 | 333 | 0.85 | 45.2 | 9.6 | 0.77 |
| 1377 | 0.82 | 0.79 | 0.81 | 1.04 | 345 | 0.88 | 42.3 | 9.6 | 0.78 |
| 1378 | 1.07 | 0.73 | 0.75 | 0.96 | 319 | 0.81 | 51.0 | 9.6 | 0.78 |
| 1379 | 1.14 | 0.71 | 0.72 | 0.93 | 309 | 0.78 | 52.5 | 9.6 | 0.79 |
| 1380 | 1.00 | 0.88 | 0.90 | 1.15 | 384 | 0.96 | 57.5 | 9.6 | 0.80 |
| 1381 | 1.21 | 0.84 | 0.85 | 1.09 | 364 | 0.91 | 65.9 | 9.6 | 0.81 |
| 1382 | 1.21 | 0.85 | 0.87 | 1.11 | 370 | 0.93 | 67.3 | 9.6 | 0.81 |
| 1383 | 1.43 | 0.80 | 0.81 | 1.04 | 346 | 0.86 | 73.7 | 9.6 | 0.82 |
| 1384 | 1.49 | 0.79 | 0.81 | 1.03 | 344 | 0.86 | 76.8 | 9.6 | 0.82 |
| 1385 | 1.37 | 0.81 | 0.83 | 1.06 | 352 | 0.88 | 72.1 | 9.6 | 0.82 |
| 1386 | 1.39 | 0.80 | 0.82 | 1.05 | 349 | 0.87 | 72.6 | 9.6 | 0.82 |
| 1387 | 1.06 | 0.88 | 0.89 | 1.14 | 381 | 0.95 | 60.5 | 9.6 | 0.82 |
| 1388 | 1.51 | 0.79 | 0.80 | 1.03 | 342 | 0.85 | 77.1 | 9.6 | 0.82 |
| 1389 | 1.80 | 0.75 | 0.76 | 0.98 | 327 | 0.82 | 88.0 | 9.6 | 0.82 |
| 1390 | 1.67 | 0.77 | 0.78 | 1.01 | 335 | 0.84 | 83.5 | 9.6 | 0.82 |
| 1391 | 1.63 | 0.78 | 0.79 | 1.01 | 338 | 0.85 | 82.3 | 9.6 | 0.82 |
| 1392 | 1.86 | 0.75 | 0.76 | 0.97 | 324 | 0.82 | 91.0 | 9.6 | 0.83 |
| 1393 | 1.36 | 0.82 | 0.83 | 1.06 | 353 | 0.90 | 72.5 | 9.6 | 0.84 |
| 1394 | 0.98 | 0.92 | 0.93 | 1.19 | 395 | 1.01 | 58.6 | 9.6 | 0.85 |
| 1395 | 1.07 | 0.89 | 0.90 | 1.15 | 383 | 0.98 | 61.5 | 9.6 | 0.86 |
| 1396 | 1.18 | 0.86 | 0.87 | 1.11 | 371 | 0.96 | 66.2 | 9.6 | 0.87 |
| 1397 | 1.21 | 0.85 | 0.86 | 1.11 | 368 | 0.95 | 67.0 | 9.6 | 0.88 |
| 1398 | 1.30 | 0.84 | 0.84 | 1.08 | 360 | 0.94 | 70.6 | 9.6 | 0.89 |
| 1399 | 1.26 | 0.85 | 0.85 | 1.10 | 365 | 0.95 | 68.9 | 9.6 | 0.90 |
| 1400 | 1.03 | 0.93 | 0.94 | 1.21 | 402 | 1.06 | 62.3 | 9.6 | 0.91 |
| 1401 | 1.03 | 0.94 | 0.95 | 1.22 | 406 | 1.06 | 62.8 | 9.6 | 0.92 |
| 1402 | 1.13 | 0.91 | 0.92 | 1.18 | 394 | 1.01 | 66.7 | 9.0 | 0.92 |
| 1403 | 0.88 | 1.00 | 1.01 | 1.30 | 433 | 1.10 | 57.4 | 9.0 | 0.92 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1404 | 0.93 | 0.98 | 0.99 | 1.27 | 422 | 1.06 | 59.2 | 9.0 | 0.92 |
| 1405 | 1.24 | 0.89 | 0.89 | 1.15 | 382 | 0.95 | 71.3 | 9.0 | 0.92 |
| 1406 | 1.16 | 0.91 | 0.91 | 1.17 | 390 | 0.96 | 68.4 | 9.0 | 0.92 |
| 1407 | 1.26 | 0.88 | 0.88 | 1.13 | 377 | 0.92 | 71.8 | 9.0 | 0.92 |
| 1408 | 1.31 | 0.87 | 0.87 | 1.12 | 372 | 0.90 | 73.8 | 9.0 | 0.92 |
| 1409 | 1.27 | 0.88 | 0.88 | 1.12 | 375 | 0.89 | 72.2 | 9.0 | 0.92 |
| 1410 | 1.03 | 0.96 | 0.96 | 1.23 | 410 | 0.97 | 63.8 | 9.0 | 0.92 |
| 1411 | 1.38 | 0.87 | 0.87 | 1.11 | 370 | 0.87 | 77.7 | 9.0 | 0.93 |
| 1412 | 1.71 | 0.81 | 0.81 | 1.04 | 347 | 0.82 | 90.3 | 9.0 | 0.93 |
| 1413 | 0.69 | 1.13 | 1.13 | 1.44 | 481 | 1.13 | 50.5 | 9.0 | 0.94 |
| 1414 | 0.83 | 1.04 | 1.04 | 1.34 | 446 | 1.05 | 56.2 | 9.0 | 0.94 |
| 1415 | 1.05 | 0.95 | 0.95 | 1.22 | 406 | 0.95 | 64.6 | 9.0 | 0.95 |
| 1416 | 1.36 | 0.87 | 0.87 | 1.12 | 372 | 0.87 | 77.0 | 9.0 | 0.95 |
| 1417 | 1.22 | 0.90 | 0.90 | 1.16 | 385 | 0.90 | 71.2 | 9.0 | 0.96 |
| 1418 | 0.94 | 1.00 | 1.00 | 1.28 | 426 | 1.00 | 60.7 | 9.0 | 0.97 |
| 1419 | 1.04 | 0.96 | 0.96 | 1.23 | 409 | 0.96 | 64.7 | 9.0 | 0.98 |
| 1420 | 1.33 | 0.89 | 0.89 | 1.15 | 382 | 0.89 | 76.8 | 9.0 | 0.99 |
| 1421 | 1.06 | 0.97 | 0.97 | 1.24 | 415 | 0.97 | 66.7 | 9.0 | 1.00 |
| 1422 | 0.81 | 1.08 | 1.08 | 1.39 | 462 | 1.08 | 57.0 | 9.0 | 1.01 |
| 1423 | 0.87 | 1.05 | 1.05 | 1.35 | 448 | 1.05 | 59.3 | 9.0 | 1.02 |
| 1424 | 0.79 | 1.10 | 1.10 | 1.41 | 469 | 1.10 | 56.6 | 9.0 | 1.02 |
| 1425 | 0.95 | 1.01 | 1.01 | 1.30 | 432 | 1.01 | 62.4 | 8.8 | 1.03 |
| 1426 | 1.00 | 0.99 | 0.99 | 1.27 | 422 | 0.98 | 63.7 | 8.8 | 1.03 |
| 1427 | 0.97 | 1.00 | 1.00 | 1.28 | 428 | 1.00 | 63.0 | 8.8 | 1.03 |
| 1428 | 0.76 | 1.11 | 1.11 | 1.43 | 475 | 1.11 | 54.7 | 8.8 | 1.03 |
| 1429 | 0.77 | 1.11 | 1.11 | 1.42 | 473 | 1.10 | 55.2 | 8.8 | 1.02 |
| 1430 | 0.84 | 1.05 | 1.05 | 1.34 | 447 | 1.04 | 56.7 | 8.8 | 1.01 |
| 1431 | 1.18 | 0.92 | 0.92 | 1.18 | 392 | 0.92 | 69.9 | 8.8 | 1.00 |
| 1432 | 1.39 | 0.87 | 0.87 | 1.11 | 371 | 0.87 | 77.9 | 8.8 | 0.99 |
| 1433 | 0.96 | 0.99 | 0.99 | 1.27 | 424 | 0.99 | 61.5 | 8.8 | 0.98 |
| 1434 | 0.91 | 1.01 | 1.01 | 1.30 | 433 | 1.02 | 60.1 | 8.8 | 0.98 |
| 1435 | 0.98 | 1.00 | 1.00 | 1.28 | 426 | 1.00 | 63.1 | 8.8 | 0.97 |
| 1436 | 1.17 | 0.94 | 0.94 | 1.21 | 402 | 0.94 | 71.5 | 8.8 | 0.96 |
| 1437 | 1.01 | 1.00 | 1.00 | 1.28 | 428 | 1.01 | 65.3 | 8.8 | 0.96 |
| 1438 | 0.98 | 1.00 | 1.00 | 1.28 | 427 | 1.01 | 63.1 | 8.8 | 0.95 |
| 1439 | 1.28 | 0.91 | 0.91 | 1.16 | 388 | 0.92 | 75.4 | 8.8 | 0.95 |
| 1440 | 1.27 | 0.91 | 0.91 | 1.17 | 388 | 0.92 | 75.0 | 8.0 | 0.95 |
| 1441 | 1.32 | 0.90 | 0.90 | 1.16 | 386 | 0.92 | 77.4 | 8.0 | 0.95 |
| 1442 | 1.64 | 0.84 | 0.84 | 1.07 | 357 | 0.85 | 88.3 | 8.0 | 0.95 |
| 1443 | 0.98 | 1.01 | 1.00 | 1.29 | 428 | 1.02 | 63.6 | 8.0 | 0.96 |
| 1444 | 1.13 | 0.96 | 0.95 | 1.22 | 405 | 0.97 | 69.4 | 8.0 | 0.97 |
| 1445 | 0.97 | 1.01 | 1.00 | 1.29 | 428 | 1.03 | 62.8 | 8.0 | 0.98 |
| 1446 | 1.01 | 0.98 | 0.98 | 1.25 | 416 | 1.01 | 63.8 | 8.0 | 0.99 |
| 1447 | 0.79 | 1.11 | 1.10 | 1.41 | 470 | 1.14 | 56.0 | 8.0 | 1.00 |
| 1448 | 0.84 | 1.07 | 1.06 | 1.36 | 454 | 1.11 | 57.8 | 8.0 | 1.00 |
| 1449 | 0.84 | 1.07 | 1.06 | 1.37 | 455 | 1.11 | 57.6 | 8.0 | 1.01 |
| 1450 | 1.02 | 0.99 | 0.98 | 1.26 | 419 | 1.03 | 64.5 | 8.0 | 1.01 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1451 | 1.04 | 0.99 | 0.98 | 1.26 | 418 | 1.04 | 65.8 | 8.0 | 1.00 |
| 1452 | 0.96 | 1.02 | 1.01 | 1.30 | 433 | 1.08 | 63.0 | 8.0 | 1.00 |
| 1453 | 0.95 | 1.02 | 1.01 | 1.30 | 433 | 1.09 | 62.1 | 8.0 | 1.00 |
| 1454 | 1.00 | 1.00 | 0.99 | 1.27 | 423 | 1.07 | 64.2 | 8.0 | 1.00 |
| 1455 | 1.14 | 0.95 | 0.94 | 1.20 | 401 | 1.02 | 68.9 | 8.0 | 0.99 |
| 1456 | 1.29 | 0.90 | 0.89 | 1.15 | 381 | 0.98 | 74.5 | 8.0 | 1.00 |
| 1457 | 1.31 | 0.90 | 0.89 | 1.14 | 378 | 0.98 | 74.6 | 8.0 | 1.00 |
| 1458 | 0.92 | 1.03 | 1.01 | 1.30 | 432 | 1.12 | 59.7 | 8.0 | 1.00 |
| 1459 | 0.82 | 1.08 | 1.07 | 1.37 | 455 | 1.19 | 56.6 | 8.0 | 1.01 |
| 1460 | 0.75 | 1.13 | 1.12 | 1.43 | 477 | 1.25 | 54.1 | 8.0 | 1.01 |
| 1461 | 0.75 | 1.13 | 1.12 | 1.43 | 477 | 1.26 | 54.1 | 7.6 | 1.01 |
| 1462 | 0.82 | 1.08 | 1.07 | 1.37 | 456 | 1.21 | 56.6 | 7.6 | 1.00 |
| 1463 | 0.94 | 1.04 | 1.02 | 1.31 | 437 | 1.17 | 61.8 | 7.6 | 0.99 |
| 1464 | 1.24 | 0.91 | 0.90 | 1.16 | 385 | 1.03 | 72.1 | 7.6 | 0.98 |
| 1465 | 1.32 | 0.91 | 0.89 | 1.15 | 382 | 1.03 | 76.1 | 7.6 | 0.98 |
| 1466 | 1.26 | 0.91 | 0.89 | 1.15 | 382 | 1.03 | 72.6 | 7.6 | 0.97 |
| 1467 | 1.20 | 0.92 | 0.91 | 1.17 | 389 | 1.06 | 70.3 | 6.9 | 0.96 |
| 1468 | 1.06 | 0.97 | 0.96 | 1.23 | 409 | 1.12 | 65.7 | 6.9 | 0.96 |
| 1469 | 1.03 | 0.99 | 0.97 | 1.25 | 415 | 1.14 | 64.5 | 6.9 | 0.95 |
| 1470 | 0.88 | 1.05 | 1.03 | 1.33 | 441 | 1.21 | 58.6 | 6.9 | 0.94 |
| 1471 | 0.90 | 1.03 | 1.02 | 1.30 | 434 | 1.20 | 58.9 | 6.9 | 0.94 |
| 1472 | 1.02 | 0.97 | 0.96 | 1.23 | 410 | 1.14 | 63.0 | 6.9 | 0.93 |
| 1473 | 1.28 | 0.89 | 0.88 | 1.13 | 375 | 1.05 | 72.5 | 6.9 | 0.91 |
| 1474 | 1.32 | 0.87 | 0.86 | 1.10 | 366 | 1.03 | 73.0 | 6.9 | 0.90 |
| 1475 | 1.25 | 0.88 | 0.87 | 1.11 | 371 | 1.05 | 69.9 | 6.9 | 0.89 |
| 1476 | 1.32 | 0.85 | 0.84 | 1.08 | 359 | 1.02 | 71.9 | 6.9 | 0.89 |
| 1477 | 1.24 | 0.87 | 0.86 | 1.10 | 366 | 1.04 | 68.7 | 6.9 | 0.88 |
| 1478 | 1.03 | 0.92 | 0.90 | 1.16 | 386 | 1.10 | 60.3 | 6.9 | 0.87 |
| 1479 | 1.09 | 0.89 | 0.88 | 1.13 | 377 | 1.08 | 62.0 | 6.9 | 0.87 |
| 1480 | 1.04 | 0.91 | 0.89 | 1.15 | 382 | 1.10 | 59.9 | 6.9 | 0.86 |
| 1481 | 1.02 | 0.91 | 0.89 | 1.14 | 381 | 1.10 | 58.9 | 6.6 | 0.86 |
| 1482 | 1.35 | 0.83 | 0.82 | 1.05 | 349 | 1.01 | 71.3 | 6.6 | 0.86 |
| 1483 | 1.61 | 0.80 | 0.78 | 1.01 | 335 | 0.97 | 81.4 | 6.6 | 0.86 |
| 1484 | 1.28 | 0.85 | 0.84 | 1.07 | 357 | 1.04 | 69.3 | 6.6 | 0.86 |
| 1485 | 1.03 | 0.91 | 0.90 | 1.15 | 383 | 1.11 | 59.7 | 6.6 | 0.86 |
| 1486 | 1.17 | 0.87 | 0.86 | 1.10 | 367 | 1.07 | 64.9 | 6.6 | 0.86 |
| 1487 | 1.21 | 0.86 | 0.85 | 1.09 | 363 | 1.06 | 66.4 | 6.6 | 0.86 |
| 1488 | 1.20 | 0.87 | 0.86 | 1.10 | 367 | 1.07 | 66.2 | 6.6 | 0.86 |
| 1489 | 1.06 | 0.90 | 0.89 | 1.14 | 378 | 1.10 | 60.7 | 6.6 | 0.86 |
| 1490 | 1.12 | 0.86 | 0.85 | 1.09 | 364 | 1.06 | 61.8 | 6.6 | 0.86 |
| 1491 | 1.04 | 0.89 | 0.87 | 1.12 | 374 | 1.09 | 58.9 | 6.6 | 0.86 |
| 1492 | 1.06 | 0.87 | 0.91 | 1.17 | 388 | 1.14 | 63.0 | 6.6 | 0.85 |
| 1493 | 1.14 | 0.86 | 0.89 | 1.14 | 379 | 1.11 | 65.9 | 6.6 | 0.84 |
| 1494 | 1.47 | 0.80 | 0.83 | 1.06 | 354 | 1.04 | 79.4 | 6.6 | 0.84 |
| 1495 | 1.41 | 0.80 | 0.83 | 1.06 | 354 | 1.04 | 76.3 | 6.6 | 0.83 |
| 1496 | 2.04 | 0.73 | 0.76 | 0.97 | 323 | 0.95 | 100.5 | 6.6 | 0.82 |
| 1497 | 1.85 | 0.75 | 0.78 | 1.00 | 331 | 0.98 | 93.7 | 6.6 | 0.81 |
| 1498 | 1.43 | 0.79 | 0.82 | 1.06 | 351 | 1.04 | 76.5 | 6.6 | 0.81 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1499 | 1.42 | 0.80 | 0.83 | 1.07 | 356 | 1.05 | 77.3 | 6.6 | 0.81 |
| 1500 | 1.52 | 0.79 | 0.82 | 1.06 | 352 | 1.04 | 81.7 | 6.6 | 0.80 |
| 1501 | 1.74 | 0.76 | 0.79 | 1.02 | 338 | 1.00 | 89.5 | 6.6 | 0.81 |
| 1502 | 1.90 | 0.75 | 0.78 | 1.00 | 333 | 1.00 | 96.3 | 6.6 | 0.81 |
| 1503 | 1.82 | 0.76 | 0.79 | 1.01 | 336 | 1.01 | 93.3 | 5.4 | 0.81 |
| 1504 | 2.45 | 0.71 | 0.74 | 0.95 | 317 | 0.96 | 118.6 | 5.4 | 0.82 |
| 1505 | 1.71 | 0.77 | 0.80 | 1.03 | 343 | 1.05 | 89.4 | 5.4 | 0.83 |
| 1506 | 1.22 | 0.85 | 0.88 | 1.13 | 376 | 1.15 | 70.2 | 5.4 | 0.85 |
| 1507 | 1.52 | 0.80 | 0.87 | 1.12 | 373 | 1.15 | 87.4 | 5.4 | 0.86 |
| 1508 | 1.32 | 0.83 | 0.91 | 1.17 | 388 | 1.21 | 79.0 | 5.4 | 0.87 |
| 1509 | 1.30 | 0.83 | 0.91 | 1.17 | 390 | 1.22 | 78.3 | 5.4 | 0.88 |
| 1510 | 1.25 | 0.85 | 0.94 | 1.20 | 400 | 1.26 | 77.4 | 5.4 | 0.89 |
| 1511 | 1.59 | 0.80 | 0.88 | 1.12 | 374 | 1.19 | 91.9 | 5.4 | 0.90 |
| 1512 | 1.49 | 0.81 | 0.89 | 1.14 | 381 | 1.22 | 87.9 | 5.4 | 0.90 |
| 1513 | 1.36 | 0.84 | 0.92 | 1.18 | 392 | 1.26 | 82.4 | 5.4 | 0.90 |
| 1514 | 1.51 | 0.81 | 0.89 | 1.14 | 381 | 1.23 | 88.8 | 5.4 | 0.90 |
| 1515 | 1.67 | 0.79 | 0.87 | 1.11 | 371 | 1.21 | 95.8 | 5.4 | 0.90 |
| 1516 | 1.61 | 0.80 | 0.88 | 1.13 | 377 | 1.24 | 93.6 | 5.4 | 0.90 |
| 1517 | 1.32 | 0.85 | 0.94 | 1.20 | 401 | 1.32 | 81.5 | 5.4 | 0.90 |
| 1518 | 1.28 | 0.86 | 0.95 | 1.21 | 404 | 1.34 | 80.0 | 5.4 | 0.89 |
| 1519 | 1.43 | 0.84 | 0.92 | 1.18 | 392 | 1.31 | 86.4 | 5.4 | 0.89 |
| 1520 | 1.41 | 0.80 | 0.88 | 1.13 | 376 | 1.26 | 82.1 | 5.4 | 0.88 |
| 1521 | 1.94 | 0.74 | 0.81 | 1.04 | 347 | 1.18 | 104.1 | 5.4 | 0.87 |
| 1522 | 2.05 | 0.73 | 0.80 | 1.03 | 343 | 1.17 | 108.6 | 5.4 | 0.86 |
| 1523 | 1.88 | 0.74 | 0.82 | 1.05 | 349 | 1.20 | 101.4 | 5.4 | 0.85 |
| 1524 | 1.25 | 0.84 | 0.92 | 1.18 | 392 | 1.35 | 75.6 | 5.4 | 0.84 |
| 1525 | 1.25 | 0.83 | 0.91 | 1.17 | 390 | 1.36 | 75.6 | 5.4 | 0.83 |
| 1526 | 1.78 | 0.75 | 0.83 | 1.06 | 353 | 1.23 | 97.2 | 5.4 | 0.82 |
| 1527 | 2.67 | 0.69 | 0.76 | 0.97 | 324 | 1.14 | 133.6 | 5.4 | 0.81 |
| 1528 | 2.85 | 0.68 | 0.75 | 0.96 | 320 | 1.13 | 140.7 | 5.4 | 0.80 |
| 1529 | 2.12 | 0.72 | 0.79 | 1.02 | 339 | 1.21 | 111.0 | 5.4 | 0.80 |
| 1530 | 3.19 | 0.69 | 0.75 | 0.96 | 321 | 1.15 | 158.3 | 5.2 | 0.80 |
| 1531 | 2.72 | 0.71 | 0.78 | 0.99 | 331 | 1.19 | 138.8 | 4.9 | 0.80 |
| 1532 | 2.40 | 0.70 | 0.77 | 0.99 | 330 | 1.19 | 122.2 | 4.9 | 0.81 |
| 1533 | 2.69 | 0.70 | 0.76 | 0.98 | 326 | 1.18 | 135.4 | 4.9 | 0.81 |
| 1534 | 1.55 | 0.80 | 0.87 | 1.12 | 373 | 1.35 | 89.2 | 4.9 | 0.82 |
| 1535 | 1.36 | 0.82 | 0.90 | 1.16 | 386 | 1.40 | 81.0 | 4.9 | 0.82 |
| 1536 | 1.48 | 0.80 | 0.88 | 1.13 | 375 | 1.37 | 85.8 | 4.9 | 0.83 |
| 1537 | 1.39 | 0.82 | 0.89 | 1.15 | 382 | 1.39 | 82.1 | 4.9 | 0.83 |
| 1538 | 1.97 | 0.74 | 0.81 | 1.04 | 347 | 1.27 | 105.7 | 4.9 | 0.83 |
| 1539 | 3.04 | 0.68 | 0.74 | 0.95 | 318 | 1.16 | 149.0 | 4.9 | 0.83 |
| 1540 | 2.57 | 0.71 | 0.78 | 1.00 | 332 | 1.22 | 131.6 | 4.9 | 0.83 |
| 1541 | 1.67 | 0.79 | 0.86 | 1.11 | 369 | 1.36 | 95.2 | 4.9 | 0.83 |
| 1542 | 1.50 | 0.81 | 0.87 | 1.12 | 373 | 1.38 | 85.7 | 4.9 | 0.83 |
| 1543 | 1.72 | 0.77 | 0.83 | 1.07 | 356 | 1.32 | 93.9 | 4.9 | 0.83 |
| 1544 | 1.71 | 0.78 | 0.84 | 1.08 | 359 | 1.33 | 94.0 | 4.9 | 0.83 |
| 1545 | 1.85 | 0.76 | 0.82 | 1.06 | 352 | 1.31 | 99.7 | 4.9 | 0.83 |
| 1546 | 1.49 | 0.81 | 0.88 | 1.12 | 374 | 1.40 | 85.1 | 4.9 | 0.82 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1547 | 2.41 | 0.72 | 0.78 | 1.00 | 333 | 1.25 | 123.1 | 4.9 | 0.82 |
| 1548 | 2.32 | 0.72 | 0.78 | 1.00 | 334 | 1.25 | 118.7 | 4.9 | 0.81 |
| 1549 | 1.86 | 0.76 | 0.82 | 1.05 | 351 | 1.32 | 100.0 | 4.9 | 0.81 |
| 1550 | 2.35 | 0.71 | 0.77 | 0.99 | 329 | 1.24 | 118.3 | 4.9 | 0.80 |
| 1551 | 1.94 | 0.74 | 0.80 | 1.03 | 341 | 1.29 | 101.5 | 4.9 | 0.79 |
| 1552 | 1.56 | 0.79 | 0.86 | 1.11 | 368 | 1.39 | 88.1 | 4.9 | 0.79 |
| 1553 | 1.77 | 0.76 | 0.83 | 1.06 | 353 | 1.34 | 95.7 | 4.9 | 0.78 |
| 1554 | 2.98 | 0.68 | 0.74 | 0.95 | 315 | 1.20 | 143.5 | 4.9 | 0.77 |
| 1555 | 3.29 | 0.67 | 0.72 | 0.93 | 309 | 1.17 | 155.3 | 4.5 | 0.77 |
| 1556 | 2.54 | 0.70 | 0.76 | 0.97 | 323 | 1.23 | 125.5 | 4.5 | 0.76 |
| 1557 | 2.76 | 0.69 | 0.73 | 0.94 | 313 | 1.20 | 131.3 | 4.5 | 0.76 |
| 1558 | 2.62 | 0.70 | 0.75 | 0.96 | 320 | 1.22 | 127.4 | 4.5 | 0.76 |
| 1559 | 2.82 | 0.69 | 0.74 | 0.94 | 314 | 1.20 | 134.7 | 4.5 | 0.76 |
| 1560 | 2.39 | 0.72 | 0.77 | 0.99 | 328 | 1.26 | 118.9 | 4.5 | 0.76 |
| 1561 | 2.41 | 0.72 | 0.77 | 0.99 | 330 | 1.27 | 120.7 | 4.5 | 0.76 |
| 1562 | 3.31 | 0.67 | 0.72 | 0.92 | 308 | 1.19 | 154.6 | 4.5 | 0.76 |
| 1563 | 2.03 | 0.75 | 0.80 | 1.03 | 343 | 1.33 | 105.6 | 4.5 | 0.77 |
| 1564 | 2.53 | 0.71 | 0.76 | 0.98 | 326 | 1.27 | 125.6 | 4.5 | 0.77 |
| 1565 | 2.55 | 0.72 | 0.77 | 0.99 | 330 | 1.29 | 127.5 | 4.5 | 0.77 |
| 1566 | 2.37 | 0.73 | 0.79 | 1.01 | 335 | 1.32 | 120.7 | 4.5 | 0.78 |
| 1567 | 1.89 | 0.78 | 0.83 | 1.07 | 356 | 1.41 | 101.9 | 4.5 | 0.78 |
| 1568 | 2.34 | 0.74 | 0.79 | 1.01 | 337 | 1.34 | 119.8 | 4.5 | 0.78 |
| 1569 | 3.27 | 0.69 | 0.74 | 0.95 | 315 | 1.26 | 156.5 | 4.5 | 0.78 |
| 1570 | 2.56 | 0.73 | 0.78 | 1.01 | 335 | 1.34 | 129.9 | 4.5 | 0.78 |
| 1571 | 2.86 | 0.72 | 0.77 | 0.98 | 327 | 1.31 | 142.1 | 4.5 | 0.78 |
| 1572 | 2.81 | 0.72 | 0.78 | 0.99 | 331 | 1.33 | 141.3 | 4.5 | 0.78 |
| 1573 | 2.26 | 0.75 | 0.80 | 1.03 | 343 | 1.37 | 118.0 | 4.5 | 0.78 |
| 1574 | 2.34 | 0.75 | 0.80 | 1.03 | 341 | 1.37 | 121.5 | 4.5 | 0.78 |
| 1575 | 2.67 | 0.72 | 0.77 | 0.99 | 331 | 1.32 | 134.2 | 4.5 | 0.78 |
| 1576 | 2.49 | 0.75 | 0.80 | 1.03 | 342 | 1.37 | 129.2 | 4.5 | 0.78 |
| 1577 | 2.56 | 0.74 | 0.79 | 1.01 | 337 | 1.35 | 131.1 | 4.5 | 0.78 |
| 1578 | 2.91 | 0.72 | 0.77 | 0.99 | 331 | 1.33 | 146.4 | 4.5 | 0.78 |
| 1579 | 3.64 | 0.69 | 0.74 | 0.95 | 318 | 1.27 | 175.7 | 4.5 | 0.77 |
| 1580 | 3.19 | 0.70 | 0.75 | 0.96 | 320 | 1.28 | 155.2 | 4.5 | 0.77 |
| 1581 | 2.90 | 0.72 | 0.77 | 0.99 | 328 | 1.32 | 144.4 | 4.5 | 0.77 |
| 1582 | 2.85 | 0.72 | 0.77 | 0.99 | 329 | 1.33 | 142.3 | 4.5 | 0.77 |
| 1583 | 2.76 | 0.73 | 0.78 | 1.01 | 335 | 1.36 | 140.7 | 4.5 | 0.77 |
| 1584 | 2.95 | 0.72 | 0.77 | 0.99 | 329 | 1.34 | 147.4 | 4.5 | 0.77 |
| 1585 | 3.07 | 0.71 | 0.76 | 0.97 | 323 | 1.32 | 150.7 | 4.5 | 0.76 |
| 1586 | 3.23 | 0.71 | 0.76 | 0.98 | 325 | 1.33 | 159.5 | 4.5 | 0.76 |
| 1587 | 2.93 | 0.72 | 0.77 | 0.99 | 330 | 1.36 | 146.9 | 4.5 | 0.76 |
| 1588 | 2.91 | 0.72 | 0.78 | 0.99 | 331 | 1.37 | 146.5 | 4.5 | 0.75 |
| 1589 | 3.15 | 0.71 | 0.76 | 0.97 | 323 | 1.34 | 154.5 | 4.5 | 0.75 |
| 1590 | 3.66 | 0.68 | 0.73 | 0.94 | 312 | 1.30 | 173.7 | 4.5 | 0.74 |
| 1591 | 4.31 | 0.66 | 0.71 | 0.91 | 303 | 1.27 | 198.6 | 4.5 | 0.74 |
| 1592 | 4.13 | 0.67 | 0.72 | 0.92 | 306 | 1.29 | 187.5 | 4.5 | 0.73 |
| 1593 | 3.21 | 0.70 | 0.75 | 0.96 | 321 | 1.36 | 153.5 | 4.5 | 0.73 |
| 1594 | 3.61 | 0.69 | 0.73 | 0.94 | 313 | 1.33 | 168.2 | 4.5 | 0.73 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1595 | 3.69 | 0.68 | 0.73 | 0.94 | 312 | 1.33 | 170.9 | 4.5 | 0.73 |
| 1596 | 4.89 | 0.65 | 0.69 | 0.89 | 296 | 1.27 | 215.6 | 4.5 | 0.72 |
| 1597 | 4.23 | 0.66 | 0.71 | 0.91 | 303 | 1.30 | 190.2 | 4.5 | 0.72 |
| 1598 | 3.56 | 0.68 | 0.73 | 0.94 | 312 | 1.34 | 165.1 | 4.5 | 0.72 |
| 1599 | 3.24 | 0.71 | 0.76 | 0.98 | 325 | 1.41 | 156.6 | 4.5 | 0.72 |
| 1600 | 3.46 | 0.69 | 0.73 | 0.94 | 313 | 1.36 | 161.4 | 4.5 | 0.72 |
| 1601 | 4.36 | 0.66 | 0.70 | 0.90 | 300 | 1.31 | 194.8 | 4.5 | 0.72 |
| 1602 | 4.28 | 0.66 | 0.71 | 0.91 | 302 | 1.32 | 192.2 | 4.5 | 0.72 |
| 1603 | 3.44 | 0.69 | 0.74 | 0.95 | 316 | 1.38 | 161.7 | 4.5 | 0.72 |
| 1604 | 3.91 | 0.67 | 0.72 | 0.92 | 306 | 1.34 | 178.0 | 4.5 | 0.72 |
| 1605 | 3.83 | 0.68 | 0.72 | 0.93 | 309 | 1.36 | 176.1 | 4.5 | 0.73 |
| 1606 | 4.44 | 0.65 | 0.70 | 0.90 | 299 | 1.32 | 197.5 | 4.5 | 0.73 |
| 1607 | 4.27 | 0.66 | 0.70 | 0.90 | 301 | 1.33 | 187.1 | 4.5 | 0.73 |
| 1608 | 3.64 | 0.68 | 0.73 | 0.93 | 311 | 1.37 | 164.7 | 4.5 | 0.74 |
| 1609 | 2.97 | 0.71 | 0.76 | 0.97 | 325 | 1.44 | 140.1 | 4.5 | 0.74 |
| 1610 | 2.68 | 0.73 | 0.78 | 1.00 | 334 | 1.48 | 130.0 | 4.5 | 0.75 |
| 1611 | 2.90 | 0.72 | 0.77 | 0.99 | 330 | 1.46 | 139.1 | 4.5 | 0.75 |
| 1612 | 3.08 | 0.71 | 0.76 | 0.98 | 325 | 1.45 | 145.6 | 4.5 | 0.76 |
| 1613 | 3.16 | 0.71 | 0.76 | 0.97 | 323 | 1.44 | 148.4 | 4.5 | 0.76 |
| 1614 | 3.10 | 0.72 | 0.77 | 0.98 | 327 | 1.46 | 147.6 | 4.5 | 0.76 |
| 1615 | 3.32 | 0.70 | 0.75 | 0.96 | 321 | 1.44 | 155.1 | 4.5 | 0.76 |
| 1616 | 2.86 | 0.73 | 0.78 | 1.00 | 333 | 1.49 | 138.8 | 4.5 | 0.76 |
| 1617 | 3.08 | 0.72 | 0.77 | 0.98 | 327 | 1.47 | 146.6 | 4.5 | 0.77 |
| 1618 | 3.62 | 0.69 | 0.74 | 0.95 | 316 | 1.42 | 166.4 | 4.5 | 0.77 |
| 1619 | 3.81 | 0.70 | 0.75 | 0.96 | 319 | 1.43 | 176.8 | 4.5 | 0.77 |
| 1620 | 3.34 | 0.72 | 0.77 | 0.98 | 328 | 1.48 | 159.4 | 4.5 | 0.77 |
| 1621 | 2.84 | 0.75 | 0.80 | 1.03 | 342 | 1.51 | 141.3 | 4.5 | 0.78 |
| 1622 | 2.99 | 0.74 | 0.79 | 1.01 | 337 | 1.45 | 147.1 | 4.5 | 0.78 |
| 1623 | 3.04 | 0.74 | 0.79 | 1.01 | 336 | 1.42 | 149.0 | 4.5 | 0.78 |
| 1624 | 2.97 | 0.74 | 0.79 | 1.02 | 339 | 1.40 | 146.5 | 4.5 | 0.78 |
| 1625 | 2.67 | 0.77 | 0.82 | 1.05 | 350 | 1.41 | 135.9 | 4.5 | 0.79 |
| 1626 | 2.86 | 0.75 | 0.80 | 1.03 | 344 | 1.35 | 142.9 | 4.5 | 0.79 |
| 1627 | 3.29 | 0.73 | 0.78 | 0.99 | 331 | 1.28 | 158.7 | 4.5 | 0.79 |
| 1628 | 3.93 | 0.70 | 0.74 | 0.95 | 318 | 1.20 | 182.1 | 4.5 | 0.79 |
| 1629 | 4.23 | 0.69 | 0.73 | 0.94 | 313 | 1.16 | 192.8 | 4.5 | 0.80 |
| 1630 | 3.86 | 0.73 | 0.78 | 1.00 | 333 | 1.20 | 186.9 | 4.5 | 0.81 |
| 1631 | 3.07 | 0.77 | 0.82 | 1.06 | 352 | 1.27 | 157.2 | 4.5 | 0.82 |
| 1632 | 2.54 | 0.81 | 0.87 | 1.12 | 372 | 1.35 | 137.4 | 4.5 | 0.82 |
| 1633 | 2.55 | 0.81 | 0.87 | 1.12 | 371 | 1.35 | 137.7 | 4.5 | 0.83 |
| 1634 | 2.42 | 0.83 | 0.88 | 1.13 | 377 | 1.37 | 132.8 | 4.5 | 0.84 |
| 1635 | 3.59 | 0.74 | 0.79 | 1.01 | 338 | 1.23 | 176.5 | 4.5 | 0.84 |
| 1636 | 3.23 | 0.76 | 0.81 | 1.04 | 346 | 1.26 | 162.6 | 4.5 | 0.85 |
| 1637 | 2.86 | 0.79 | 0.84 | 1.08 | 359 | 1.31 | 149.2 | 4.5 | 0.85 |
| 1638 | 2.45 | 0.82 | 0.88 | 1.13 | 375 | 1.37 | 133.9 | 4.5 | 0.86 |
| 1639 | 2.43 | 0.82 | 0.88 | 1.13 | 375 | 1.38 | 133.0 | 4.5 | 0.86 |
| 1640 | 2.29 | 0.84 | 0.90 | 1.15 | 383 | 1.41 | 127.5 | 4.5 | 0.86 |
| 1641 | 2.26 | 0.86 | 0.91 | 1.17 | 391 | 1.42 | 128.3 | 4.5 | 0.86 |
| 1642 | 2.41 | 0.84 | 0.86 | 1.10 | 367 | 1.33 | 127.5 | 4.5 | 0.85 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1643 | 2.95 | 0.79 | 0.81 | 1.04 | 346 | 1.25 | 147.0 | 4.5 | 0.84 |
| 1644 | 2.91 | 0.79 | 0.81 | 1.04 | 347 | 1.25 | 145.4 | 4.5 | 0.84 |
| 1645 | 2.59 | 0.82 | 0.84 | 1.08 | 359 | 1.28 | 133.9 | 4.5 | 0.83 |
| 1646 | 2.50 | 0.83 | 0.85 | 1.09 | 363 | 1.29 | 130.5 | 4.5 | 0.82 |
| 1647 | 2.94 | 0.79 | 0.81 | 1.04 | 346 | 1.22 | 146.6 | 4.5 | 0.82 |
| 1648 | 3.48 | 0.75 | 0.78 | 1.00 | 331 | 1.16 | 166.2 | 4.5 | 0.81 |
| 1649 | 3.86 | 0.74 | 0.76 | 0.97 | 324 | 1.13 | 179.9 | 4.5 | 0.81 |
| 1650 | 3.68 | 0.73 | 0.75 | 0.96 | 321 | 1.11 | 170.0 | 4.5 | 0.81 |
| 1651 | 2.53 | 0.81 | 0.83 | 1.06 | 354 | 1.24 | 129.0 | 4.5 | 0.81 |
| 1652 | 2.46 | 0.81 | 0.84 | 1.07 | 357 | 1.26 | 126.4 | 4.5 | 0.81 |
| 1653 | 2.55 | 0.80 | 0.83 | 1.06 | 353 | 1.25 | 129.5 | 4.5 | 0.81 |
| 1654 | 2.46 | 0.81 | 0.84 | 1.07 | 357 | 1.27 | 126.3 | 4.5 | 0.81 |
| 1655 | 2.43 | 0.82 | 0.84 | 1.08 | 358 | 1.29 | 125.4 | 4.5 | 0.81 |
| 1656 | 2.68 | 0.79 | 0.81 | 1.04 | 348 | 1.26 | 134.2 | 4.5 | 0.81 |
| 1657 | 2.60 | 0.80 | 0.79 | 1.01 | 338 | 1.23 | 125.2 | 4.5 | 0.81 |
| 1658 | 2.63 | 0.79 | 0.78 | 1.01 | 335 | 1.23 | 125.1 | 4.5 | 0.81 |
| 1659 | 2.62 | 0.79 | 0.78 | 1.01 | 335 | 1.24 | 125.1 | 4.5 | 0.81 |
| 1660 | 2.74 | 0.80 | 0.80 | 1.02 | 341 | 1.27 | 132.9 | 4.5 | 0.81 |
| 1661 | 2.53 | 0.82 | 0.82 | 1.05 | 348 | 1.30 | 125.7 | 4.5 | 0.81 |
| 1662 | 2.46 | 0.83 | 0.82 | 1.06 | 351 | 1.32 | 123.2 | 4.5 | 0.82 |
| 1663 | 2.50 | 0.83 | 0.82 | 1.05 | 350 | 1.32 | 124.6 | 4.5 | 0.82 |
| 1664 | 2.52 | 0.82 | 0.82 | 1.05 | 349 | 1.32 | 125.1 | 4.5 | 0.82 |
| 1665 | 2.43 | 0.83 | 0.83 | 1.06 | 353 | 1.34 | 122.2 | 4.5 | 0.83 |
| 1666 | 2.21 | 0.86 | 0.85 | 1.09 | 363 | 1.39 | 114.5 | 4.5 | 0.83 |
| 1667 | 2.20 | 0.86 | 0.85 | 1.09 | 364 | 1.40 | 114.0 | 4.5 | 0.83 |
| 1668 | 2.28 | 0.85 | 0.84 | 1.08 | 360 | 1.39 | 117.0 | 4.5 | 0.83 |
| 1669 | 2.55 | 0.82 | 0.81 | 1.04 | 348 | 1.35 | 126.4 | 4.5 | 0.82 |
| 1670 | 2.52 | 0.81 | 0.80 | 1.03 | 343 | 1.33 | 122.9 | 4.5 | 0.82 |
| 1671 | 2.39 | 0.82 | 0.82 | 1.05 | 348 | 1.36 | 118.7 | 4.5 | 0.82 |
| 1672 | 2.27 | 0.83 | 0.82 | 1.05 | 351 | 1.38 | 113.4 | 4.5 | 0.81 |
| 1673 | 2.23 | 0.83 | 0.83 | 1.06 | 353 | 1.40 | 112.1 | 4.5 | 0.81 |
| 1674 | 2.29 | 0.83 | 0.82 | 1.05 | 350 | 1.39 | 114.0 | 4.5 | 0.80 |
| 1675 | 2.76 | 0.78 | 0.77 | 0.99 | 331 | 1.32 | 130.2 | 4.5 | 0.79 |
| 1676 | 2.66 | 0.79 | 0.78 | 1.00 | 334 | 1.34 | 126.2 | 4.5 | 0.79 |
| 1677 | 3.03 | 0.76 | 0.75 | 0.97 | 322 | 1.30 | 139.0 | 4.5 | 0.79 |
| 1678 | 3.05 | 0.76 | 0.75 | 0.97 | 322 | 1.31 | 139.6 | 4.5 | 0.78 |
| 1679 | 2.80 | 0.78 | 0.77 | 0.99 | 329 | 1.35 | 131.0 | 4.5 | 0.78 |
| 1680 | 2.64 | 0.78 | 0.77 | 0.99 | 330 | 1.36 | 123.9 | 4.5 | 0.78 |
| 1681 | 2.42 | 0.80 | 0.79 | 1.02 | 339 | 1.40 | 117.0 | 4.5 | 0.78 |
| 1682 | 2.34 | 0.81 | 0.80 | 1.03 | 343 | 1.42 | 114.3 | 4.5 | 0.78 |
| 1683 | 2.27 | 0.82 | 0.81 | 1.04 | 346 | 1.45 | 111.8 | 4.5 | 0.78 |
| 1684 | 2.53 | 0.79 | 0.78 | 1.00 | 335 | 1.41 | 120.8 | 4.5 | 0.78 |
| 1685 | 2.99 | 0.76 | 0.75 | 0.96 | 320 | 1.35 | 136.1 | 4.5 | 0.78 |
| 1686 | 2.70 | 0.78 | 0.77 | 0.99 | 329 | 1.40 | 126.4 | 4.5 | 0.78 |
| 1687 | 2.26 | 0.82 | 0.81 | 1.04 | 346 | 1.48 | 111.6 | 4.5 | 0.78 |
| 1688 | 2.32 | 0.81 | 0.80 | 1.03 | 343 | 1.47 | 113.4 | 4.5 | 0.78 |
| 1689 | 2.35 | 0.81 | 0.80 | 1.03 | 342 | 1.48 | 114.3 | 4.5 | 0.77 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1690 | 2.63 | 0.76 | 0.75 | 0.97 | 322 | 1.40 | 120.5 | 4.5 | 0.77 |
| 1691 | 2.61 | 0.76 | 0.76 | 0.97 | 323 | 1.40 | 119.7 | 4.5 | 0.77 |
| 1692 | 2.73 | 0.75 | 0.77 | 0.99 | 331 | 1.44 | 126.9 | 4.5 | 0.76 |
| 1693 | 2.82 | 0.75 | 0.77 | 0.98 | 327 | 1.43 | 129.7 | 4.5 | 0.76 |
| 1694 | 3.27 | 0.72 | 0.74 | 0.95 | 315 | 1.39 | 144.9 | 4.5 | 0.76 |
| 1695 | 3.46 | 0.71 | 0.73 | 0.93 | 311 | 1.37 | 151.4 | 4.5 | 0.75 |
| 1696 | 3.42 | 0.71 | 0.73 | 0.94 | 312 | 1.38 | 150.0 | 4.5 | 0.76 |
| 1697 | 3.21 | 0.72 | 0.74 | 0.95 | 316 | 1.40 | 142.8 | 4.5 | 0.76 |
| 1698 | 2.86 | 0.74 | 0.76 | 0.98 | 326 | 1.45 | 131.1 | 4.5 | 0.76 |
| 1699 | 2.76 | 0.75 | 0.77 | 0.99 | 329 | 1.47 | 127.6 | 4.5 | 0.76 |
| 1700 | 2.62 | 0.77 | 0.79 | 1.02 | 339 | 1.52 | 124.9 | 4.5 | 0.77 |
| 1701 | 2.78 | 0.76 | 0.79 | 1.01 | 336 | 1.51 | 131.1 | 4.5 | 0.77 |
| 1702 | 2.93 | 0.76 | 0.78 | 1.00 | 334 | 1.50 | 137.4 | 4.5 | 0.78 |
| 1703 | 2.79 | 0.77 | 0.79 | 1.02 | 338 | 1.53 | 132.7 | 4.5 | 0.78 |
| 1704 | 2.74 | 0.77 | 0.80 | 1.02 | 340 | 1.54 | 131.0 | 4.5 | 0.79 |
| 1705 | 2.72 | 0.78 | 0.80 | 1.02 | 341 | 1.55 | 130.1 | 4.5 | 0.79 |
| 1706 | 2.84 | 0.77 | 0.79 | 1.01 | 337 | 1.53 | 134.3 | 4.5 | 0.80 |
| 1707 | 2.92 | 0.76 | 0.81 | 1.04 | 347 | 1.58 | 140.6 | 4.5 | 0.80 |
| 1708 | 2.94 | 0.76 | 0.81 | 1.04 | 346 | 1.58 | 141.3 | 4.5 | 0.81 |
| 1709 | 3.71 | 0.72 | 0.77 | 0.98 | 327 | 1.50 | 168.5 | 4.5 | 0.82 |
| 1710 | 3.28 | 0.76 | 0.81 | 1.04 | 347 | 1.60 | 158.2 | 4.5 | 0.83 |
| 1711 | 2.74 | 0.80 | 0.85 | 1.10 | 365 | 1.69 | 138.6 | 4.3 | 0.83 |
| 1712 | 2.64 | 0.81 | 0.86 | 1.11 | 369 | 1.71 | 135.1 | 4.3 | 0.84 |
| 1713 | 2.64 | 0.81 | 0.86 | 1.11 | 369 | 1.72 | 135.0 | 4.3 | 0.85 |
| 1714 | 2.86 | 0.82 | 0.88 | 1.12 | 374 | 1.75 | 148.6 | 4.3 | 0.86 |
| 1715 | 2.98 | 0.80 | 0.86 | 1.10 | 367 | 1.72 | 151.4 | 4.3 | 0.87 |
| 1716 | 2.71 | 0.80 | 0.86 | 1.10 | 366 | 1.73 | 137.8 | 4.3 | 0.87 |
| 1717 | 2.64 | 0.81 | 0.86 | 1.11 | 369 | 1.75 | 135.1 | 4.3 | 0.88 |
| 1718 | 2.70 | 0.80 | 0.86 | 1.10 | 366 | 1.74 | 137.3 | 4.3 | 0.89 |
| 1719 | 2.46 | 0.82 | 0.88 | 1.13 | 376 | 1.80 | 128.7 | 4.3 | 0.90 |
| 1720 | 2.28 | 0.87 | 0.93 | 1.19 | 395 | 1.90 | 125.0 | 4.3 | 0.90 |
| 1721 | 2.37 | 0.85 | 0.91 | 1.17 | 390 | 1.88 | 128.6 | 4.3 | 0.91 |
| 1722 | 2.43 | 0.85 | 0.91 | 1.16 | 387 | 1.87 | 130.8 | 4.3 | 0.91 |
| 1723 | 2.18 | 0.88 | 0.94 | 1.20 | 401 | 1.95 | 121.2 | 4.3 | 0.92 |
| 1724 | 2.05 | 0.90 | 0.96 | 1.23 | 410 | 2.00 | 116.3 | 4.3 | 0.92 |
| 1725 | 2.28 | 0.86 | 0.92 | 1.18 | 392 | 1.92 | 124.3 | 4.3 | 0.92 |
| 1726 | 2.45 | 0.84 | 0.90 | 1.15 | 384 | 1.89 | 130.5 | 4.3 | 0.92 |
| 1727 | 2.34 | 0.86 | 0.92 | 1.18 | 392 | 1.94 | 127.4 | 4.3 | 0.91 |
| 1728 | 2.31 | 0.86 | 0.92 | 1.18 | 394 | 1.95 | 126.2 | 4.3 | 0.91 |
| 1729 | 2.28 | 0.87 | 0.93 | 1.19 | 395 | 1.97 | 125.0 | 4.3 | 0.90 |
| 1730 | 2.18 | 0.85 | 0.91 | 1.16 | 388 | 1.94 | 117.3 | 4.3 | 0.89 |
| 1731 | 2.42 | 0.82 | 0.88 | 1.13 | 375 | 1.88 | 126.0 | 4.2 | 0.88 |
| 1732 | 2.35 | 0.83 | 0.89 | 1.14 | 379 | 1.90 | 123.3 | 4.2 | 0.87 |
| 1733 | 2.93 | 0.78 | 0.83 | 1.07 | 355 | 1.79 | 144.5 | 4.2 | 0.86 |
| 1734 | 3.42 | 0.75 | 0.80 | 1.03 | 342 | 1.72 | 162.1 | 4.2 | 0.86 |
| 1735 | 3.22 | 0.76 | 0.81 | 1.04 | 347 | 1.75 | 155.0 | 4.2 | 0.85 |
| 1736 | 2.93 | 0.78 | 0.83 | 1.07 | 355 | 1.80 | 144.3 | 4.2 | 0.85 |
| 1737 | 2.59 | 0.80 | 0.86 | 1.10 | 367 | 1.86 | 132.2 | 4.2 | 0.85 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1738 | 2.70 | 0.81 | 0.87 | 1.11 | 370 | 1.88 | 138.6 | 4.2 | 0.84 |
| 1739 | 2.69 | 0.81 | 0.87 | 1.11 | 371 | 1.88 | 138.2 | 4.2 | 0.84 |
| 1740 | 2.83 | 0.79 | 0.85 | 1.08 | 361 | 1.84 | 141.6 | 4.2 | 0.84 |
| 1741 | 2.99 | 0.78 | 0.83 | 1.07 | 356 | 1.82 | 147.8 | 3.9 | 0.84 |
| 1742 | 2.84 | 0.79 | 0.85 | 1.10 | 365 | 1.86 | 144.3 | 3.9 | 0.84 |
| 1743 | 2.91 | 0.79 | 0.85 | 1.09 | 362 | 1.85 | 147.0 | 3.9 | 0.84 |
| 1744 | 2.70 | 0.79 | 0.85 | 1.09 | 363 | 1.86 | 136.4 | 3.9 | 0.83 |
| 1745 | 2.75 | 0.78 | 0.85 | 1.09 | 361 | 1.85 | 138.2 | 3.9 | 0.83 |
| 1746 | 3.16 | 0.76 | 0.82 | 1.05 | 348 | 1.79 | 153.3 | 3.9 | 0.83 |
| 1747 | 3.40 | 0.74 | 0.80 | 1.03 | 342 | 1.76 | 162.0 | 3.9 | 0.83 |
| 1748 | 3.44 | 0.75 | 0.81 | 1.04 | 345 | 1.78 | 165.5 | 3.9 | 0.83 |
| 1749 | 3.11 | 0.77 | 0.83 | 1.06 | 355 | 1.83 | 153.6 | 3.9 | 0.83 |
| 1750 | 3.49 | 0.76 | 0.82 | 1.06 | 352 | 1.82 | 170.7 | 3.9 | 0.84 |
| 1751 | 3.50 | 0.76 | 0.82 | 1.05 | 351 | 1.82 | 171.1 | 3.9 | 0.84 |
| 1752 | 3.19 | 0.78 | 0.84 | 1.08 | 359 | 1.87 | 159.5 | 3.9 | 0.85 |
| 1753 | 2.69 | 0.82 | 0.88 | 1.13 | 377 | 1.96 | 141.2 | 3.9 | 0.85 |
| 1754 | 2.65 | 0.82 | 0.88 | 1.13 | 377 | 1.96 | 139.4 | 3.9 | 0.85 |
| 1755 | 2.88 | 0.80 | 0.86 | 1.11 | 368 | 1.92 | 147.9 | 3.9 | 0.86 |
| 1756 | 3.05 | 0.79 | 0.85 | 1.09 | 363 | 1.89 | 153.8 | 3.9 | 0.86 |
| 1757 | 3.14 | 0.78 | 0.85 | 1.09 | 363 | 1.90 | 159.4 | 3.9 | 0.86 |
| 1758 | 3.06 | 0.79 | 0.86 | 1.10 | 366 | 1.92 | 156.2 | 3.9 | 0.86 |
| 1759 | 3.09 | 0.78 | 0.85 | 1.10 | 365 | 1.91 | 157.3 | 3.9 | 0.86 |
| 1760 | 2.76 | 0.80 | 0.87 | 1.12 | 372 | 1.96 | 143.5 | 3.9 | 0.86 |
| 1761 | 2.68 | 0.81 | 0.88 | 1.13 | 376 | 1.97 | 140.6 | 3.9 | 0.86 |
| 1762 | 2.63 | 0.81 | 0.89 | 1.14 | 378 | 1.98 | 138.6 | 3.9 | 0.86 |
| 1763 | 2.80 | 0.80 | 0.87 | 1.11 | 371 | 1.94 | 145.1 | 3.9 | 0.85 |
| 1764 | 3.01 | 0.78 | 0.85 | 1.09 | 363 | 1.90 | 152.7 | 3.9 | 0.85 |
| 1765 | 3.19 | 0.77 | 0.83 | 1.07 | 356 | 1.86 | 158.8 | 3.9 | 0.84 |
| 1766 | 3.60 | 0.74 | 0.80 | 1.03 | 343 | 1.79 | 172.7 | 3.9 | 0.83 |
| 1767 | 3.58 | 0.75 | 0.82 | 1.05 | 349 | 1.81 | 174.5 | 3.9 | 0.83 |
| 1768 | 3.35 | 0.76 | 0.83 | 1.07 | 355 | 1.84 | 166.1 | 3.9 | 0.82 |
| 1769 | 3.20 | 0.77 | 0.84 | 1.08 | 359 | 1.86 | 160.7 | 3.9 | 0.81 |
| 1770 | 3.44 | 0.74 | 0.80 | 1.03 | 342 | 1.77 | 164.4 | 3.9 | 0.80 |
| 1771 | 3.55 | 0.73 | 0.79 | 1.02 | 339 | 1.76 | 168.2 | 3.9 | 0.80 |
| 1772 | 4.05 | 0.71 | 0.77 | 0.99 | 329 | 1.72 | 186.1 | 3.9 | 0.79 |
| 1773 | 3.92 | 0.71 | 0.78 | 1.00 | 331 | 1.74 | 181.6 | 3.9 | 0.78 |
| 1774 | 4.25 | 0.70 | 0.76 | 0.98 | 326 | 1.71 | 193.2 | 3.9 | 0.78 |
| 1775 | 4.46 | 0.69 | 0.75 | 0.97 | 322 | 1.70 | 200.8 | 3.9 | 0.78 |
| 1776 | 3.64 | 0.72 | 0.79 | 1.01 | 337 | 1.79 | 171.6 | 3.9 | 0.77 |
| 1777 | 4.16 | 0.70 | 0.77 | 0.98 | 327 | 1.75 | 190.1 | 3.9 | 0.77 |
| 1778 | 4.82 | 0.69 | 0.75 | 0.96 | 319 | 1.71 | 214.8 | 3.9 | 0.77 |
| 1779 | 3.95 | 0.72 | 0.78 | 1.00 | 333 | 1.80 | 183.9 | 3.9 | 0.77 |
| 1780 | 3.46 | 0.74 | 0.81 | 1.04 | 346 | 1.87 | 167.4 | 3.9 | 0.77 |
| 1781 | 3.85 | 0.72 | 0.79 | 1.01 | 337 | 1.83 | 181.3 | 3.8 | 0.77 |
| 1782 | 4.10 | 0.71 | 0.78 | 1.00 | 332 | 1.81 | 189.9 | 3.8 | 0.77 |
| 1783 | 4.30 | 0.71 | 0.77 | 0.99 | 328 | 1.79 | 197.0 | 3.8 | 0.77 |
| 1784 | 4.07 | 0.70 | 0.77 | 0.98 | 327 | 1.80 | 186.3 | 3.8 | 0.77 |
| 1785 | 3.90 | 0.71 | 0.77 | 0.99 | 331 | 1.82 | 180.1 | 3.8 | 0.77 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1786 | 3.69 | 0.72 | 0.78 | 1.00 | 335 | 1.85 | 172.6 | 3.8 | 0.77 |
| 1787 | 4.17 | 0.70 | 0.76 | 0.98 | 326 | 1.80 | 189.9 | 3.8 | 0.77 |
| 1788 | 3.77 | 0.72 | 0.78 | 1.00 | 333 | 1.85 | 175.5 | 3.8 | 0.77 |
| 1789 | 3.81 | 0.71 | 0.78 | 1.00 | 332 | 1.85 | 176.9 | 3.8 | 0.76 |
| 1790 | 3.98 | 0.68 | 0.74 | 0.95 | 316 | 1.77 | 175.4 | 3.8 | 0.76 |
| 1791 | 3.64 | 0.69 | 0.75 | 0.97 | 322 | 1.80 | 163.8 | 3.8 | 0.76 |
| 1792 | 3.86 | 0.68 | 0.76 | 0.97 | 324 | 1.82 | 180.5 | 3.8 | 0.76 |
| 1793 | 4.54 | 0.66 | 0.73 | 0.94 | 314 | 1.76 | 205.4 | 3.8 | 0.76 |
| 1794 | 4.48 | 0.67 | 0.75 | 0.96 | 318 | 1.79 | 206.1 | 3.8 | 0.76 |
| 1795 | 4.60 | 0.69 | 0.77 | 0.98 | 327 | 1.84 | 217.2 | 3.8 | 0.76 |
| 1796 | 4.75 | 0.69 | 0.77 | 0.99 | 328 | 1.85 | 225.4 | 3.8 | 0.76 |
| 1797 | 5.03 | 0.70 | 0.78 | 1.00 | 332 | 1.87 | 240.7 | 3.8 | 0.76 |
| 1798 | 5.13 | 0.72 | 0.79 | 1.02 | 339 | 1.92 | 251.0 | 3.8 | 0.76 |
| 1799 | 5.84 | 0.69 | 0.77 | 0.99 | 329 | 1.86 | 277.3 | 3.8 | 0.76 |
| 1800 | 8.25 | 0.66 | 0.73 | 0.94 | 313 | 1.78 | 372.7 | 3.8 | 0.76 |
| 1801 | 7.99 | 0.65 | 0.72 | 0.93 | 309 | 1.76 | 356.3 | 3.8 | 0.77 |
| 1802 | 6.13 | 0.67 | 0.75 | 0.96 | 319 | 1.82 | 282.2 | 3.8 | 0.77 |
| 1803 | 5.40 | 0.69 | 0.77 | 0.98 | 328 | 1.88 | 255.6 | 3.8 | 0.77 |
| 1804 | 4.82 | 0.72 | 0.80 | 1.03 | 342 | 1.97 | 238.1 | 3.8 | 0.78 |
| 1805 | 4.98 | 0.70 | 0.78 | 0.99 | 331 | 1.92 | 237.9 | 3.8 | 0.78 |
| 1806 | 5.23 | 0.72 | 0.79 | 1.02 | 339 | 1.97 | 256.1 | 3.8 | 0.79 |
| 1807 | 5.02 | 0.70 | 0.80 | 1.02 | 340 | 1.98 | 255.4 | 3.8 | 0.79 |
| 1808 | 4.70 | 0.74 | 0.84 | 1.08 | 359 | 2.10 | 252.5 | 3.8 | 0.79 |
| 1809 | 4.62 | 0.75 | 0.85 | 1.08 | 361 | 2.12 | 249.4 | 3.8 | 0.79 |
| 1810 | 5.93 | 0.69 | 0.78 | 1.00 | 333 | 1.96 | 295.6 | 3.8 | 0.79 |
| 1811 | 6.97 | 0.67 | 0.75 | 0.97 | 322 | 1.91 | 336.3 | 3.8 | 0.79 |
| 1812 | 6.36 | 0.68 | 0.77 | 0.99 | 329 | 1.96 | 312.9 | 3.8 | 0.79 |
| 1813 | 5.66 | 0.70 | 0.79 | 1.02 | 338 | 2.04 | 286.5 | 3.8 | 0.79 |
| 1814 | 5.84 | 0.71 | 0.80 | 1.03 | 342 | 2.08 | 299.0 | 3.8 | 0.79 |
| 1815 | 7.11 | 0.68 | 0.77 | 0.98 | 327 | 2.00 | 348.0 | 3.8 | 0.79 |
| 1816 | 7.61 | 0.67 | 0.75 | 0.97 | 322 | 1.99 | 367.0 | 3.8 | 0.79 |
| 1817 | 7.34 | 0.67 | 0.76 | 0.98 | 325 | 2.01 | 356.6 | 3.8 | 0.79 |
| 1818 | 5.38 | 0.72 | 0.82 | 1.05 | 350 | 2.18 | 281.4 | 3.8 | 0.79 |
| 1819 | 4.60 | 0.72 | 0.81 | 1.04 | 347 | 2.18 | 238.4 | 3.8 | 0.80 |
| 1820 | 4.84 | 0.72 | 0.81 | 1.04 | 347 | 2.20 | 251.0 | 3.8 | 0.80 |
| 1821 | 5.19 | 0.71 | 0.80 | 1.02 | 341 | 2.18 | 264.8 | 3.8 | 0.81 |
| 1822 | 4.92 | 0.71 | 0.81 | 1.04 | 345 | 2.22 | 254.2 | 3.8 | 0.81 |
| 1823 | 4.88 | 0.72 | 0.81 | 1.04 | 348 | 2.26 | 254.0 | 3.8 | 0.82 |
| 1824 | 4.44 | 0.74 | 0.83 | 1.07 | 357 | 2.33 | 236.7 | 3.8 | 0.82 |
| 1825 | 4.68 | 0.73 | 0.82 | 1.06 | 352 | 2.31 | 246.2 | 3.8 | 0.82 |
| 1826 | 4.49 | 0.75 | 0.85 | 1.09 | 362 | 2.40 | 243.3 | 3.8 | 0.83 |
| 1827 | 4.78 | 0.74 | 0.83 | 1.07 | 356 | 2.38 | 254.5 | 3.8 | 0.83 |
| 1828 | 5.32 | 0.73 | 0.82 | 1.06 | 352 | 2.37 | 280.3 | 3.8 | 0.83 |
| 1829 | 5.42 | 0.72 | 0.82 | 1.05 | 351 | 2.38 | 284.1 | 3.8 | 0.83 |
| 1830 | 4.93 | 0.72 | 0.81 | 1.04 | 346 | 2.37 | 255.6 | 3.8 | 0.84 |
| 1831 | 4.96 | 0.74 | 0.84 | 1.07 | 358 | 2.49 | 265.5 | 3.8 | 0.84 |
| 1832 | 4.77 | 0.75 | 0.85 | 1.09 | 361 | 2.56 | 257.9 | 3.8 | 0.84 |
| 1833 | 4.70 | 0.75 | 0.85 | 1.09 | 363 | 2.62 | 255.2 | 3.8 | 0.84 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1834 | 4.56 | 0.76 | 0.86 | 1.10 | 366 | 2.69 | 249.6 | 3.8 | 0.84 |
| 1835 | 4.65 | 0.78 | 0.88 | 1.13 | 376 | 2.82 | 261.9 | 3.8 | 0.84 |
| 1836 | 5.27 | 0.72 | 0.82 | 1.05 | 349 | 2.66 | 274.9 | 3.8 | 0.83 |
| 1837 | 5.90 | 0.70 | 0.80 | 1.02 | 340 | 2.64 | 299.6 | 3.8 | 0.83 |
| 1838 | 5.48 | 0.71 | 0.81 | 1.04 | 345 | 2.73 | 283.0 | 3.8 | 0.83 |
| 1839 | 5.73 | 0.71 | 0.80 | 1.03 | 342 | 2.76 | 292.9 | 3.8 | 0.83 |
| 1840 | 5.77 | 0.73 | 0.83 | 1.06 | 353 | 2.90 | 304.4 | 3.8 | 0.82 |
| 1841 | 5.34 | 0.74 | 0.84 | 1.08 | 360 | 2.97 | 288.0 | 3.8 | 0.82 |
| 1842 | 5.30 | 0.75 | 0.85 | 1.09 | 363 | 3.00 | 294.3 | 3.8 | 0.82 |
| 1843 | 5.52 | 0.71 | 0.81 | 1.04 | 345 | 2.86 | 291.3 | 3.8 | 0.82 |
| 1844 | 5.49 | 0.71 | 0.81 | 1.04 | 345 | 2.87 | 290.3 | 3.8 | 0.81 |
| 1845 | 5.31 | 0.72 | 0.82 | 1.05 | 348 | 2.91 | 282.8 | 3.8 | 0.81 |
| 1846 | 5.51 | 0.71 | 0.81 | 1.04 | 345 | 2.89 | 291.0 | 3.8 | 0.81 |
| 1847 | 6.10 | 0.69 | 0.79 | 1.01 | 337 | 2.83 | 314.4 | 3.8 | 0.80 |
| 1848 | 5.49 | 0.71 | 0.81 | 1.04 | 346 | 2.91 | 290.2 | 3.8 | 0.80 |
| 1849 | 5.59 | 0.71 | 0.81 | 1.03 | 344 | 2.90 | 294.1 | 3.8 | 0.79 |
| 1850 | 5.29 | 0.70 | 0.80 | 1.02 | 340 | 2.87 | 274.9 | 3.8 | 0.79 |
| 1851 | 5.27 | 0.70 | 0.80 | 1.02 | 340 | 2.89 | 274.4 | 3.8 | 0.78 |
| 1852 | 5.60 | 0.69 | 0.78 | 1.01 | 335 | 2.86 | 287.2 | 3.8 | 0.77 |
| 1853 | 6.17 | 0.67 | 0.77 | 0.98 | 328 | 2.81 | 309.3 | 3.8 | 0.77 |
| 1854 | 8.55 | 0.63 | 0.72 | 0.92 | 306 | 2.64 | 391.4 | 3.8 | 0.77 |
| 1855 | 8.11 | 0.64 | 0.72 | 0.93 | 309 | 2.67 | 374.9 | 3.8 | 0.77 |
| 1856 | 7.95 | 0.64 | 0.73 | 0.93 | 310 | 2.70 | 368.6 | 3.8 | 0.77 |
| 1857 | 6.84 | 0.69 | 0.78 | 1.01 | 335 | 2.93 | 358.5 | 3.8 | 0.77 |
| 1858 | 5.90 | 0.71 | 0.81 | 1.04 | 348 | 3.05 | 321.0 | 3.8 | 0.77 |
| 1859 | 6.60 | 0.69 | 0.79 | 1.01 | 337 | 2.97 | 347.9 | 3.8 | 0.78 |
| 1860 | 6.70 | 0.68 | 0.79 | 1.01 | 335 | 2.97 | 351.6 | 3.8 | 0.78 |
| 1861 | 6.93 | 0.69 | 0.78 | 1.00 | 333 | 2.97 | | | 0.79 |
| 1862 | 6.74 | | 0.80 | 1.03 | 343 | 3.07 | | | 0.79 |
| 1863 | 6.58 | | 0.82 | 1.05 | 350 | 3.14 | | | 0.80 |
| 1864 | 6.27 | | 0.81 | 1.03 | 344 | 3.10 | | | 0.80 |
| 1865 | 6.41 | | 0.85 | 1.09 | 362 | 3.28 | | | 0.80 |
| 1866 | 6.83 | | 0.79 | 1.01 | 337 | 3.06 | | | 0.81 |
| 1867 | 7.35 | | 0.80 | 1.02 | 340 | 3.10 | | | 0.81 |
| 1868 | 7.18 | | 0.80 | 1.03 | 342 | 3.13 | | | 0.82 |
| 1869 | 6.99 | | 0.82 | 1.05 | 351 | 3.23 | | | 0.82 |
| 1870 | 7.32 | | 0.86 | 1.11 | 368 | 3.40 | | | 0.83 |
| 1871 | 8.30 | | 0.86 | 1.10 | 366 | 3.40 | | | 0.84 |
| 1872 | 8.84 | | 0.84 | 1.08 | 360 | 3.36 | | | 0.84 |
| 1873 | 9.27 | | 0.84 | 1.08 | 360 | 3.38 | | | 0.85 |
| 1874 | 8.63 | | 0.90 | 1.16 | 385 | 3.63 | | | 0.86 |
| 1875 | 8.24 | | 0.88 | 1.13 | 377 | 3.58 | | | 0.87 |
| 1876 | 7.84 | | 0.85 | 1.09 | 363 | 3.47 | | | 0.88 |
| 1877 | 8.27 | | 0.86 | 1.11 | 368 | 3.53 | | | 0.89 |
| 1878 | 8.55 | | 0.91 | 1.16 | 387 | 3.74 | | | 0.90 |
| 1879 | 8.52 | | 0.90 | 1.16 | 386 | 3.75 | | | 0.91 |
| 1880 | 8.24 | | 0.93 | 1.19 | 396 | 3.87 | | | 0.92 |
| 1881 | 8.11 | | 0.95 | 1.22 | 407 | 4.00 | | | 0.93 |
| 1882 | 7.74 | | 0.97 | 1.25 | 416 | 4.13 | | | 0.95 |

| | 1<br>Price index 1420–40 = 1 | 2<br>Per capita GDP index agriculture 1420–40 = 1 | 3<br>Per capita GDP index 1420–40 = 1 | 4<br>Per capita GDP index 1861 = 1 | 5<br>Per capita GDP 1911 prices | 6<br>GDP index 1420–40 = 1 | 7<br>Per capita GDP Florentine lire (current prices) | 8<br>Weight Florentine lire (gr. silver) | 9<br>Hodrick-Prescott filter of series in col. 3 |
|---|---|---|---|---|---|---|---|---|---|
| 1883 | 7.41 | | 0.99 | 1.26 | 421 | 4.22 | | | 0.96 |
| 1884 | 6.91 | | 0.96 | 1.23 | 408 | 4.13 | | | 0.97 |
| 1885 | 6.62 | | 0.98 | 1.26 | 420 | 4.30 | | | 0.98 |
| 1886 | 6.48 | | 1.03 | 1.32 | 440 | 4.55 | | | 0.99 |
| 1887 | 6.50 | | 1.04 | 1.34 | 446 | 4.66 | | | 1.00 |
| 1888 | 6.61 | | 1.03 | 1.32 | 441 | 4.65 | | | 1.01 |
| 1889 | 6.83 | | 1.00 | 1.28 | 425 | 4.53 | | | 1.02 |
| 1890 | 7.02 | | 1.02 | 1.31 | 436 | 4.69 | | | 1.02 |
| 1891 | 7.03 | | 1.05 | 1.34 | 447 | 4.86 | | | 1.03 |
| 1892 | 6.84 | | 1.04 | 1.33 | 444 | 4.86 | | | 1.04 |
| 1893 | 6.44 | | 1.07 | 1.37 | 455 | 5.02 | | | 1.05 |
| 1894 | 6.34 | | 1.07 | 1.37 | 457 | 5.07 | | | 1.06 |
| 1895 | 6.37 | | 1.08 | 1.39 | 462 | 5.16 | | | 1.07 |
| 1896 | 6.58 | | 1.09 | 1.40 | 467 | 5.26 | | | 1.08 |
| 1897 | 6.57 | | 1.10 | 1.41 | 470 | 5.33 | | | 1.09 |
| 1898 | 6.54 | | 1.11 | 1.42 | 472 | 5.39 | | | 1.11 |
| 1899 | 6.52 | | 1.12 | 1.44 | 478 | 5.49 | | | 1.13 |
| 1900 | 6.51 | | 1.14 | 1.47 | 489 | 5.66 | | | 1.15 |
| 1901 | 6.52 | | 1.17 | 1.50 | 498 | 5.80 | | | 1.17 |
| 1902 | 6.58 | | 1.19 | 1.53 | 509 | 5.98 | | | 1.19 |
| 1903 | 6.50 | | 1.22 | 1.57 | 522 | 6.18 | | | 1.22 |
| 1904 | 6.64 | | 1.26 | 1.62 | 538 | 6.42 | | | 1.25 |
| 1905 | 6.59 | | 1.30 | 1.67 | 555 | 6.68 | | | 1.28 |
| 1906 | 6.64 | | 1.33 | 1.71 | 570 | 6.92 | | | 1.31 |
| 1907 | 6.67 | | 1.38 | 1.77 | 588 | 7.20 | | | 1.34 |
| 1908 | 6.91 | | 1.40 | 1.79 | 596 | 7.35 | | | 1.37 |
| 1909 | 7.12 | | 1.42 | 1.82 | 606 | 7.54 | | | 1.39 |
| 1910 | 7.21 | | 1.42 | 1.82 | 607 | 7.61 | | | 1.42 |
| 1911 | 7.36 | | 1.44 | 1.84 | 614 | 7.77 | | | 1.45 |
| 1912 | 7.45 | | 1.49 | 1.91 | 635 | 8.09 | | | 1.48 |
| 1913 | 7.47 | | 1.55 | 1.98 | 660 | 8.44 | | | 1.51 |

## Appendix 3: Four series of per capita GDP in Italy 1861–1913 (1911 prices)

The following Figure A3.1 allows to grasp the differences between the series in column II (Fenoaltea 2005a and 2005b) and III (Malanima 2006a). Both series are based on the same evidence for agriculture and industry, but on different shares of the service sector on GDP. Fenoaltea estimates the output of services through data and assumptions on transportation, communication, trade and credit. In his estimate, the share of services on GDP is almost stable in the years 1861–1913 (from 34.8 to 36.8 per cent). However, more recently, Fenoaltea revised the share apportioned to services (Fenoaltea forthcoming, table 1). In this revision, services

represent 31 per cent and 32 per cent (in two diverse series) in 1861 and 37 per cent in 1913. In Malanima, following Maddison (1991) from 1861 until 1891, and Zamagni-Battilani in 1891 and 1911 (*Conti (I) economici dell'Italia*, 1, 1991; 3, 2002) services represent 27 per cent in 1861 and 38 per cent in 1913. The higher starting point of Fenoaltea's series implies a different position of Italy in the European context around 1870. Although the series by Maddison is based on the Istat series, the structure of GDP is not the same. In the recent Battilani (2010), the percentage of services is 26 in 1861 and 38 in 1911. The only difference between the series by Fenoaltea and Malanima depends on the diverse estimate of the tertiary sector. The correlation is 0.996.

The following series are computed at factor prices, present borders and 1911 constant prices.

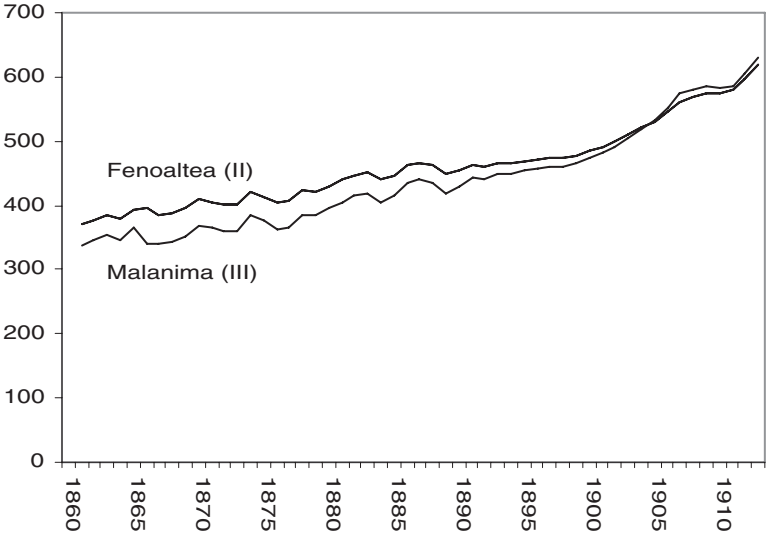


Figure A3.1. *Two series of per capita GDP in Italy 1861–1913 (1911 prices)*

*Source*: cols. II and III of the following table.

| | I | II | III | IV | V |
|---|---|---|---|---|---|
| | Maddison | Fenoaltea | Malanima | Index of III 1861 = 1 | 1990 Intern. PPP $ series in III and IV |
| 1861 | 331 | 371 | 336 | 1.00 | 1,486 |
| 1862 | 339 | 377 | 345 | 1.03 | 1,531 |
| 1863 | 330 | 384 | 353 | 1.05 | 1,560 |
| 1864 | 337 | 378 | 346 | 1.03 | 1,531 |
| 1865 | 344 | 393 | 364 | 1.08 | 1,605 |
| 1866 | 357 | 397 | 339 | 1.01 | 1,501 |
| 1867 | 326 | 386 | 341 | 1.01 | 1,501 |
| 1868 | 338 | 388 | 343 | 1.02 | 1,516 |

| | I<br>Maddison | II<br>Fenoaltea | III<br>Malanima | IV<br>Index of III<br>1861 = 1 | V<br>1990 Intern. PPP $<br>series in III and IV |
|---|---|---|---|---|---|
| 1869 | 339 | 395 | 352 | 1.05 | 1,560 |
| 1870 | 342 | 410 | 369 | 1.10 | 1,635 |
| 1871 | 344 | 405 | 366 | 1.09 | 1,620 |
| 1872 | 337 | 401 | 360 | 1.07 | 1,590 |
| 1873 | 348 | 402 | 359 | 1.07 | 1,590 |
| 1874 | 344 | 422 | 385 | 1.15 | 1,709 |
| 1875 | 352 | 414 | 376 | 1.12 | 1,664 |
| 1876 | 343 | 404 | 362 | 1.08 | 1,605 |
| 1877 | 340 | 407 | 367 | 1.09 | 1,620 |
| 1878 | 343 | 423 | 386 | 1.15 | 1,709 |
| 1879 | 345 | 422 | 385 | 1.15 | 1,709 |
| 1880 | 360 | 431 | 395 | 1.18 | 1,753 |
| 1881 | 333 | 440 | 405 | 1.21 | 1,798 |
| 1882 | 360 | 447 | 414 | 1.23 | 1,828 |
| 1883 | 357 | 451 | 419 | 1.25 | 1,858 |
| 1884 | 357 | 440 | 404 | 1.20 | 1,783 |
| 1885 | 362 | 447 | 416 | 1.24 | 1,843 |
| 1886 | 375 | 462 | 435 | 1.29 | 1,917 |
| 1887 | 383 | 465 | 441 | 1.31 | 1,947 |
| 1888 | 379 | 462 | 435 | 1.29 | 1,917 |
| 1889 | 360 | 448 | 418 | 1.24 | 1,843 |
| 1890 | 381 | 456 | 429 | 1.28 | 1,902 |
| 1891 | 376 | 464 | 443 | 1.32 | 1,962 |
| 1892 | 353 | 460 | 439 | 1.31 | 1,947 |
| 1893 | 367 | 467 | 449 | 1.34 | 1,991 |
| 1894 | 359 | 467 | 450 | 1.34 | 1,991 |
| 1895 | 362 | 469 | 455 | 1.35 | 2,006 |
| 1896 | 369 | 471 | 458 | 1.36 | 2,021 |
| 1897 | 350 | 473 | 460 | 1.37 | 2,036 |
| 1898 | 379 | 474 | 461 | 1.37 | 2,036 |
| 1899 | 385 | 477 | 465 | 1.38 | 2,051 |
| 1900 | 404 | 485 | 475 | 1.41 | 2,095 |
| 1901 | 427 | 492 | 483 | 1.44 | 2,140 |
| 1902 | 412 | 499 | 492 | 1.46 | 2,170 |
| 1903 | 429 | 510 | 504 | 1.50 | 2,229 |
| 1904 | 430 | 521 | 518 | 1.54 | 2,288 |
| 1905 | 451 | 531 | 533 | 1.59 | 2,363 |
| 1906 | 464 | 546 | 546 | 1.63 | 2,422 |
| 1907 | 513 | 562 | 562 | 1.67 | 2,482 |
| 1908 | 522 | 568 | 568 | 1.69 | 2,511 |
| 1909 | 558 | 575 | 575 | 1.71 | 2,541 |
| 1910 | 534 | 574 | 574 | 1.71 | 2,541 |
| 1911 | 565 | 580 | 580 | 1.73 | 2,571 |
| 1912 | 565 | 598 | 598 | 1.78 | 2,645 |
| 1913 | 585 | 620 | 620 | 1.85 | 2,749 |